

THE EXPERT SIGN PAINTER

A. ASHMUN KELLY



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—THE—
Expert Sign Painter

A BOOK OF REFERENCE DESIGNED FOR
THE USE OF PRACTICAL SIGN
PAINTERS & LETTERERS

BY

A. ASHMUN KELLY

Formerly Instructor at the Indianapolis Technical Institute
And now Editor and Publisher of the
MASTER PAINTER

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To
My esteemed friend,
Mr. Alfred Burdsal,
of Indianapolis, Ind.,
in appreciation of his interest in
expert workmanship
This Book
is
respectfully dedicated by
the Author

PREFACE.

DURING the past few years quite a number of works for sign painters have appeared from the press, but these have mainly been devoted to illustrations, or lay-outs and alphabets of various kinds, the text part being almost nil. To supply the need for a practical text book, a need that I have clearly recognized during my several years' experience as an editor of a painter's periodical, and also while instructing in the sign painting art at the Indianapolis Technical Institute, some five years ago, the present work is here offered.

In making this book I have been under obligations to many of the leading sign painters of the country, and also to various trade publications, and to these I wish to extend, as far as I can, due credit. My work has indeed been that of the editor, not of the author. I am able in only a few cases to render credit by name, but all whose writings have contributed toward this work, whether small or large it may have been, have the assurance that goes with all good and worthy deeds, that they carry their own reward in satisfaction felt from the consciousness of so doing.

In the forty-eight chapters of this work will be found the most that can be given regarding the art and practise of sign painting in this country. Many minds are represented therein. Various methods for doing various things are given, all equally good, though differing in minor points. The book is intended for the expert workman, not the learner or amateur. It is a book of ready reference.

I have consulted all the books there are, of domestic and foreign origin, relating to the subject of sign painting, and have also carefully gleaned the pages of the various trade publications for the past several years for matter relating to the subject, and what I have gathered in this way has been carefully edited or revised as the case required, and thus I have sought to give the book a permanent and practical value that could not be secured by hasty or less careful work. I have spent the greater part of the present year in the preparation of the work. And now I offer it to the trade, with the hope and expectation that it will meet a real need and adequately supply that need. There is no other book at least that comes as near to this mark.

THE AUTHOR.

*Malvern, Penn'a.,
December, 1910.*

CHAPTER I.

An Historical Sketch of the Art.



WHEN the cities of Pompeii and Herculaneum were dug out of the ashes, which covered them for centuries, the diggers came across many emblematic signs that had done duty before the old Roman inns. The first sign of which we have any historical knowledge was a bunch of grapes, carved in stone, and which was hung above the portals of one of these old-time taverns. For the first signs were carved or moulded from clay, succeeding which came the painted sign. The Greeks also employed signs in the same way, as we gather from allusions to them by the old Greek writers.

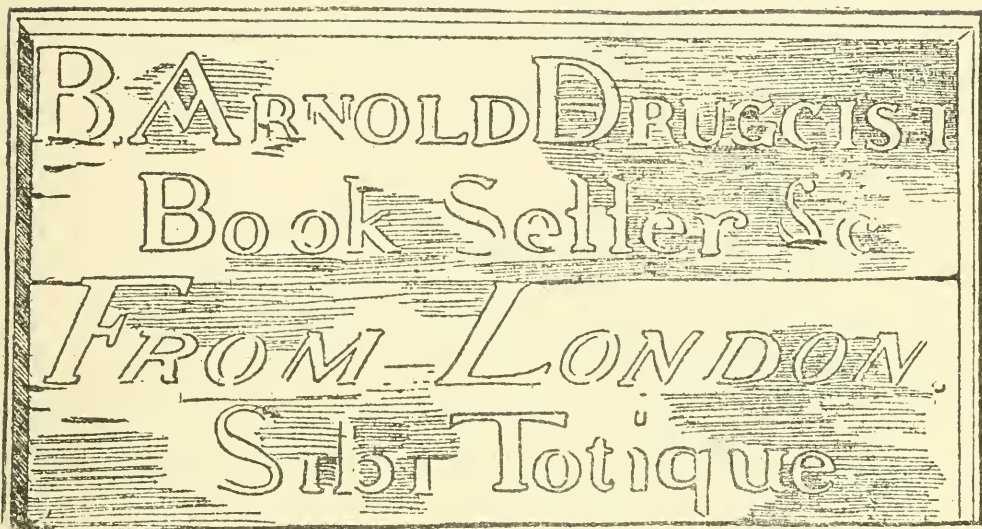
During the middle ages, in Europe, when the people were seldom able to read, for education was far from being general, it was necessary for tradesmen to have signs before their places, to indicate the nature of the business they were conducting. The symbolic sign was then most in evidence, such as the three gilded balls, of the pawnbroker, and which is one of the ancient forms that survives to this day. The barber pole is another example. In Russia, at the present time, symbolic signs are used, the people being, as a mass, uneducated, unable to read, and even those who can read find difficulty in making out the letters of the Russian alphabet, which consists of thirty-six letters, and which seem to have the combined difficulties of the Greek, Chinese and Arabian characters. Hence, the signs on the stores of Russia are mostly pictorial, a language understood by all people.

A century ago, in England, it was not unusual to find signs painted by the best artists of the day, some-

times as payment to mine host for lodging and food furnished, and more rarely, perhaps, in return for needed cash, in the usual commercial manner. Many interesting and often amusing tales are on record concerning the painting of some inn signs, done by famous painters. Quite recently a famous English artist has done the sign of the Swan Inn, at Rayne, Essex, and Mr. Frith, a veteran R. A., mentions in a current paper having painted a sign board in Lancashire for an inn called the Pilgrim. He says: "My friend Augustus Egg painted one side of the sign, and I the other. Egg's pilgrim was knocking at one side of the sign, on which a door was limned; on the reverse side my pilgrim was leaving the inn refreshed, thankfully casting his eyes heavenward." The late Walter Crane did a clever sign showing the Fox and Pelican, for a small Surrey inn. Many such instances are recorded of British artists. In our country, in its early days, both before and succeeding the Revolutionary war, sign painting was an art indeed, and in my historical account of the old-time signs of Philadelphia I have given instances showing the high character of the work done then in this line, some of the sign painters being artists of the highest rank. But perhaps the most illustrious as well as famous, and subsequently infamous, of artists in this country who have wielded the brush and pencil on sign work was Benedict Arnold.

BENEDICT ARNOLD'S SIGN.—Benedict Arnold lived in New Haven, Conn., from 1761 to 1775. He had learned the trade of apothecary, and this business he followed with success in New Haven. His shop was opposite the Yale campus, but later on he moved to a substantial shop in Leather Lane, now George street, near the spot where New Haven was settled in 1637. This shop was at the town market place, where countrymen and tradesmen assembled every

day, and his business became great. The sign which he swung over his shop door is now hanging in the rooms of the New Haven Colony Historical Society, and it reads as follows:



The last line is Latin, and means, "For himself and others." As for the "From London" part, Arnold had never been in London, and doubtless it was done to be up to his business neighbors, all of whom adopted fictitious honors to draw trade. Arnold was egotistical to the last degree, and his sign well portrays his character.

JAMES WHITCOMB RILEY.—As this work is being prepared for the press, word comes that America's poet of homely things has been stricken with partial paralysis, and it is therefore meet that a word should be said concerning Mr. Riley. He began life as a sign painter, and it is said that he was a good one, too. If he had failed as a writer of popular verses,

at which he has amassed a goodly fortune, he would have been successful as a sign painter, for he has the artistic temperament, and did very fine work when he did work at it.

There have been other American sign painters who have distinguished themselves in other lines, Arthur Quartly, for instance, who was well known for his oil paintings. But as I had not intended writing a series of memoirs, the account may reasonably stop here.

And the sign itself has been immortalized, if I may be allowed the expression, by one of the world's more illustrious painters, Meissonier, in his famous picture of "The Sign Painter," the picture itself having no doubt been suggested to the artist by the number of really excellent signs seen over the doors of inns in his day. *The Spectator*, a periodical published in the days of Queen Anne, speaking of the signs used then, says: "Some of these were so elaborately and beautifully done that they deserved rather to be in a picture gallery than on a sign post."

The most important event in sign painting in our country was the introduction of the art of gilding letters on glass, in 1828, by an Englishman by the name of Edwards. This gave great impetus to the art of sign painting for business houses, banks, etc., and its importance cannot be over-estimated. In this connection I may state that the trick of cutting the leaf with the finger nail originated with a Pittsburgh, Pa., sign painter, if I may believe the statement he made to me in a letter a few years ago. He said:

"I want to ask the brethren of the craft how many of them, especially the oil size gilders, cut the leaf with their forefinger-nail to the size needed for the tip? In the middle Fifties, I had to gild figure-heads

and trail-boards for sailing vessels. I was taught to use the cushion and knife, having to sit on the stays or bowsprit, or wherever there was a place, to gild the carvings. There was a great loss of the gold leaf, which increased the cost of the work, or reduced the profits. Being ambitious, I tried different plans, one of which was to take up an empty book, cut the leaves apart, turn up the back edge one-fourth of an inch, and with a bit of white wax rub one side of the book leaf, and then press this, wax side down, onto the gold leaf. Then I placed such leaves in a box with a lid, and whenever I needed any I would take out the leaves and cut them to any desired size. This plan worked very well, with little loss of gold, but it was difficult to get into the recesses of the carvings well.

“How I came to discover that I could make a leaf from an empty book, I do not remember, but I do remember that I used this plan as early as 1855, and it is my plan in all sign work to-day, never having been able to improve upon it. I take a leaf from an empty book for the first leaf. A leaf of gold is three and one-fourth inches square; Hasting’s leaf is, at least. The Chinese leaf is two and one-half inches square. Knowing the width of the cover, I lay the book leaf, after turning the first page, covering all the surface of the leaf except that part which I want to take up with the tip. After using the first leaf, I fold back the page lying on the leaf of gold, exposing the size I want lightly running my finger-nail along the folded page, and lift with the tip as small a piece as one-eighth of an inch.

“I believe that I was the originator of this method, although it is likely that others may have thought out the same idea, years before, though if this is so I never heard of it. My reasons for believing myself

the inventor of the plan have been strengthened by a little incident which occurred a few years ago. I had an apprentice who developed a taste for artistic decoration, and, whilst he was of profitable service to me as a house painter, yet his appeals to me to help him to get a place with a decorator or fresco painter, induced me to interest myself in his behalf in that direction, and I succeeded in getting him with a very good man. He remained two years with this man, and then learning that at Nuremburg, Germany, there was a free school where he could get full tuition in decoration, he went there and enrolled as a student. One day one of the professors asked him if he could lay gold leaf, and he replied that he could. So the professor handed him the cushion and knife and tip, whereupon the young man asked what they were for. 'Oh,' replied the professor, 'you can not gild.' But the young man asked to be given the work, and see whether he could do it right or not. The astonishment of the teacher was very great when he saw the American boy proceed to lay the leaf in the manner in which I had taught him to do. Nobody in the institution had ever heard of such a way. He was asked who had taught him to gild in such a manner, and upon getting all the particulars, an account of the method was published in their magazine, as being something entirely new. Mind you, this was less than twenty years ago, so that I still think that I originated the idea. The student, by the way, is now a well-known fresco artist, doing work in Western Pennsylvania, Virginia and Eastern Ohio."

Another invention of importance was the wire sign. VanDyne says that it was accidentally discovered in Boston, Mass., in 1873, by Edward Southard, a sail maker who carried on the business in the top story of a building on a prominent side street, a

few doors from the corner of a busy business street. For years he had hung out in front of his place a canvas banner, on a pole, and lettered on both sides. The wind would play havoc with this banner sign, so that he had to renew it about once a year. Then he thought of cutting holes in the canvas, to allow the wind to pass through, which only partially remedied the trouble. It was a fishing net that he had to repair that set him to thinking out the wire screen sign, or its forerunner. With heavy twine he knitted a piece of netting six by ten feet, bound the edges with rope, and placed rings along the top portion. Canvas letters were cut out and painted and sewed on to the netting. He was advised by a lawyer to have his method patented, which he was not slow to follow out, and which led to a lot of interesting legal skirmishing that needs not be related here, but which brings in Mr. Chas. Strong, then a New York sign painter, but now of Detroit, Mich. All of which led to improvements, such as metal frames, wire netting, etc.

The wooden letter came into general use about the year 1876, and it soon became a popular favorite, just as the electric sign has done in recent times. In a short time it was used in every sign shop, so that prices were greatly reduced, and profits correspondingly cut down. Then some one thought of attaching the raised wooden letters to wire screen. Ordinary poultry wire was at first used, but some inventive genius, with bright foresight, thought of the wire body and iron frame sign.

The introduction of the electric sign is of such recent history that I need scarcely refer to it here; in a chapter on the subject I have given some account of it that may well take the place of what I might otherwise have said here.

And now, what is a sign painter? Is he a sign writer also? And what is a letterer? Is he too a sign painter? In a little book issued in London not long since, the editor (for the book consists of articles that were originally written for a periodical called *Work*) says: "The modern practice of sign painting, accepting the term in its original sense, is an almost obsolete art, which survives only in the royal arms, shields, and in some hotel boards. . . . The precise name of this art has invariably presented a difficulty with previous writers on the subject. . . . There are three distinct classes of work, sign painting, sign writing, and lettering. The sign painter is an artist capable, as a rule, of doing any class of letter painting. The sign writer is capable of doing any class of writing and lettering, from church work to the outside of a tradesman's shop, but stopping short of pictorial work. The letterer may be an ordinary painter, who is able to exactly form letters and numerals, and who by practice acquires considerable skill. Most of this last class are to be found in wheelwrights' and carriage builders' yards, and in the railway carriage and wagon works. They generally use block letters, simply shaded. . . . this work is simply letter painting."

But the definitions given do not apply here, and certainly sign painting has changed in the last half-century, so that we may designate the art now as simply sign painting, which embraces the painting of the board or other surface to receive the letters, and the lettering itself. Pictorial work is hardly a part of sign painting now, as it was almost to the exclusion of lettering in the olden days, and when such work is done a specialist, a sort of artist, often indeed a very good artist, does the work, as on banner painting and on advertising signs on walls.

A word or two concerning the letters and numerals the sign painter employs. It would be out of place here to enter into any deep inquiry concerning the origin and evolution of our common speech, as it finds expression through symbols called letters, of which we employ twenty-six to express all our wants and thoughts. Our alphabet came to us from a Hebrew source, but its present form is a modernized Roman, and any one curious to know all about the origin of written speech and its development should consult a good encyclopedia, like the Brittanica, the Americanized one being precisely as good. That our present so-called Roman letters are as nearly perfect in every way as human ingenuity can make letters I fully believe. I have alluded to the rather mixed Russian alphabet, and comparison with ours should be a source of pride as well as of gratification to us. Our letters serve their purpose in sign work admirably, as they possess distinct individuality, and in combinations of words they cannot cause confusion of form or in any other manner. They have also considerable artistic value, they are simple and chaste in design, and in a word are perfect. In a former age it was the custom to so highly ornament a letter that it was difficult to decipher it. The intent was to make ornament rather than meaning. The old Gothic letters were of this class. Legibility is the prime quality of a letter. Individuality is another important attribute of a letter. A century ago the "f" and "s" were so nearly alike in form that it was impossible sometimes to tell which was meant. The result was such words as bleffing, purposefs, muft, etc., meaning blessing, purposes, and must. The "s" and "f" were used interchangeably, as though identical. In the word muft the "f" and "t" were joined at the top, and in connect or any word ending with

.

“ct,” the last two letters were thus connected. In this instance the combination forms a character much like that which stands for the ampersand, or &. In fact, “et,” standing for & and having the form &, was so made. Again, in early days we find the “v” used in place of “u,” a practice revived of late years in architectural work. I have books, printed in 1798, that show the use of the “s” and “f” as I have indicated, and in another book, printed in 1811, I do not find it so, but the reading is exactly as it would be now. As late as 1818 the capitals “I” and “J” and lower-case “i” and “j” were used as being identical, as may be seen in Todd’s Johnson’s Dictionary of that date. Iohn was meant for John, and instances of this use of the “I” may be seen in old graveyards, on ancient tombstones. Then, there was a time when the “i” was not dotted, the dot coming into use somewhere during the Fourteenth century.

Regarding our numerals, it is said that the use of symbols to represent numbers is older than writing. Our very remote ancestors did their figuring by means of their fingers, and this method is in use to this day with many persons, who may be seen counting up on their fingers. We got our word digit from that circumstance, the Latin word for finger being *digitus*. Then the fingers became numbers in course of time, as follows: I II III IV V VI VII VIII IX X. The V was made by holding up the fore and second finger, divergent at the top. The X was made by crossing two fingers. This simple method was further improved by the addition of letters to represent higher sums than could be signified by the fingers alone. This the Romans did. Thus, XXX, representing 30, was prefixed by C, making 130. By further adding VI as a terminal was obtained the sum, 136. The full amount would be represented thus:

CXXXVI. By this system of notation C stands for 100, M for 1000, and so on.

Our present decimal system of numbers, in its complete form, or inclusive of the zero mark, 0, is of Indian origin. The Indians gave it to the Arabians about 773, A. D. Europe got the complete system, including the zero mark, in the Twelfth century. Chaucer, about the middle of the Fourteenth century, mentions "figures newe," doubtless alluding to these Indian or new Arabic numerals. In his day the Roman numerals were in common use.

For some years the forms of the Arabic numerals were faulty, notably so in the case of the 3 and 5, which were made so nearly alike that it was difficult if not impossible to tell one from the other. Even to-day the 5 is often made with its upper member projecting forward, like 5, and this form is not advised as good for sign painters' use.

By our method of laying out numerals there is no chance for mistaking any one of them, for each is himself and no one else. Thus, when we paint in 1369, each numeral stands out clear and distinct, and if ever, in the process of time, the 9 and 6 should be shorn of their tails, we should still know one from the other from the position each holds in line. If we make a 9 resting its body on the lower line and take away its tail, we could not tell it from a tailless 6.

CHAPTER II.

Lettering and Letters.



IT would be unwise to lay down any hard-and-fast rules as to what constitutes good style in lettering, a statement that would have been uncalled for twenty years ago. The sign artist of to-day revels in a delirium of fantastic shapes and forms of letters, and the classic old Roman or block letter are both too tame for his red blood. All of which is in strict keeping with the tendency of this strenuous age. Still, it may be said of the sign making art, as has been truly spoken of art in general, that it is subject to changes which come through the influence on the mind of surroundings which are ever varying.

Classic art was succeeded by the Gothic, which in turn was followed by the Renaissance, and so on. If real advance is to be made we must break from pre-existent forms. Not that we ought ever to abandon any good form like the Roman letter, but we must not be governed by rules that governed in the past and under widely different circumstances.

Lettering should be, first, legible; secondly, in harmony with surrounding architecture and ornament; and, thirdly, it should possess decorative value. These are the modern requirements, the basis of good lettering. Beyond these considerations "bad lettering" can only be admitted when widely accepted ideas are transgressed—with regard to proportion, when letters are made exceptionally high and narrow, or low and broad, when some letters are unnecessarily cramped while others are inflated—with

regard to size, when some letters, such as O, are made only half the size of their neighbors—or when letters are represented as being two or three inches thick with excessive shading and perspective effects.

We must not make the mistake of condemning a virile, live style of lettering simply because it does not conform to the peculiarities of another style. This is particularly applicable to what is known as publicity lettering, which must of necessity show as much individuality as possible in order to serve its purpose. Obviously a standard form of letter would defeat this very object.

Speaking of lettering from its mechanical standpoint, the sign painter needs to be exact, a true draughtsman, combining with this, artistic ability; all of which come from sufficient training. For this work it is not required that the workman be a genius, born with natural bent, as the saying goes, for many very deficient in this respect have become excellent sign letterers. By carefully studying the best forms, watching the best work of the experts, and ceaselessly practicing, one may succeed in becoming approximately perfect.

Simplicity is the keynote to satisfactory lettering. Much depends upon the purpose of the sign as to the selection of lettering. Certain letters fit or adapt themselves to certain purposes better than other forms will. The style of letter must, therefore, be chosen with reference to the business or purpose the sign is to exploit. This is important.

Plain lettering does for most commercial businesses, but when what is called the artistic form of lettering is employed, we must not make the mistake of choosing thin, light letters for the purpose, though very often letters of this class answer the description of artistic. Letters possess character, just as per-

sons do; some are coarse and stout; others are as distinctly high-bred looking, delicate and refined. Of the former class we may mention the bulletin letters; of the latter the French style are examples. But each has its honest use in the art, just as the rugged laborer and well-kept tradesman have theirs in life.

It is necessary that a sign painter should know how to make every description of letter, and make it accurately. There are many forms of one common type of letter, but he should conform to the generally accepted definition of that form. Individuality is very well in a sign painter's work, but the line between that and eccentricity must not be passed. Again, knowing how to form all letters and other sign characters perfectly, the sign artist will be able to do cheap work that will possess attractiveness, just as well as costlier work. Both must bear the ear-marks of good workmanship, the visible evidence of the touch of a master hand.

The true artist will avoid over-ornamentation, or that which obviously is meant to fill up space where space is over-abundant. Lettering may be in curving lines, or diagonally across the face of the sign, where the board is too short to take the line well. But this must be done carefully, in order to avoid bringing the fact of shortage too much in evidence, or saying in effect that the lettering would be the better of a larger board.

An office building affords splendid scope for the display of one's ability and individuality. As a rule, office building owners will not allow the lettering to be anywhere but on the glass of the windows or doors of the rooms; they often also require that there be a certain uniformity of the lettering or style. In such cases the artist is, of course, somewhat handi-

capped or deprived of considerable freedom of movement, and yet under the limitations he can, if able and so disposed, execute some very original work, preserving his individuality.

Speaking of the French styles, they are built on very fine lines, being thin, and possess distinction and character. They do not take well to shading; but, on the other hand, they appear best as they are, and really take the place of the old-style shaded letter, where something fancy is desired. The shaded letter may be said to have outlived its usefulness. It is a back-number now. Delicately formed and carefully spaced and arranged, in connection with an equally well designed color scheme, these letters offer a decided advantage over the old shaded letters, and where something more than their mere lines are desired they may be outlined to good effect. To put the matter in another way, the present day sign artist depends more upon color than upon form for effects, in this working somewhat along the lines followed by the house decorator.

What is known as the Antique or Old-Style Roman letter is in many cases merely a mongrel form composed of the French and Old-Style Roman letters. The same general principles are involved in both forms, yet it will be seen by reference to the respective alphabets that there is a wide dissimilarity between the two, not one letter of the Antique being precisely like the Roman. The Antique is much lighter in form, although many sign painters do not observe this distinction. The spurs differ, and in many points the difference is quite as marked.

There is a mistaken notion abroad that there is something gained by making letters stout and bold. In certain classes of work, poster work for instance, the body of the letter is intentionally designed to

cover more space than the background. For such work, as well as for wall painting, fairly stout letters are best, but this can be over-done. What we wish in this place to call attention to is the fact that where a letter is made bold in order to be seen more readily we may easily over-rate the importance of such a letter. For instance, within limits a large letter is no more conspicuous than a moderately sized one. It will be even less so if the artist has crowded the letters in order to make size, leaving meagre margins and space between lines. A sign should never be crowded, particularly if not close to the reader. Plenty of open space helps wonderfully in making the sign readable.

The altitude of a sign must be considered when planning for its lettering. Some one suggests that different sized letters be displayed in a window at about the height that the sign is to occupy, and note the apparent size of same when viewed from the street. The letter O will require particular attention, in order that it may not look too narrow-chested at a height. The letters must be large enough to be read easily, and all fine lines must be broadened proportionately. At near view the sign would look crude; but this we may accept as inevitable. It is of course less trouble to get the correct sized letter before the sign is up than afterwards.

CORRECT PROPORTIONS OF LETTERS.—A very good way to get the correct proportions of letters is to take some ruled paper, drawn to fifths, and allow a space containing 25 of these units for what we will call a normal letter, or one of the majority that can be well made inside of a normal space of 25 units. Those letters which may be formed within the normal limits are—B C D G K P R S T X Z and &. These being Roman capitals.

For A you will add 1-5; for E deduct 1-2 of 1-5; for F the same as E; for H deduct 1-4 of 1-5; give letter I 1-5 width; deduct 1-5 for J; and the same for L; add 1-5 for M; deduct 1-2 of 1-5 for N; for O add 1-2 of 1-5; the same for Q; for U 1-4 of 1-5 less; for V add 1-2 of 1-5; for W add 2-5; and for Y add 1-2 of 1-5.

The same rules apply to the capitals in full blocks, while T is 1-2 of 1-5 less in Egyptians. The same also for condensed and elongated letters, while in L E F H J N and T the narrowing may be still more without detriment to the letters involved.

Such capitals as C G O and Q should be placed a trifle closer to each other than others, owing to their rounded sides, while the letters B D E H K M N R U S X and Z may be given a little more space between. The open letters, A F J L P T V W Y, need to be placed very close together.

On the block letters, Full, Half-round and Egyptian, make all the horizontal strokes slightly less than the upright strokes, because of the optical illusion which makes the horizontals look much larger than the vertical strokes, while they are at the same time identical.

All round or oval letters must be made to go above and below the horizontal lines a trifle, owing to optical illusion, which otherwise would make them appear smaller than they really are; the oval letters, too, cannot be well rounded out within normal letter space.

Never condense a letter more than 2-5, nor extend or lengthen a letter more than 5-5.

Be careful when laying out script that you do not get the angle of inclination too great. The degree of inclination suitable for printed matter would not

be the best for a sign, because the position of the reader in either case is very different.

When making the letter A be careful to not give it too much spread. Let its spurs extend a little beyond the normal letter limits. This applies to the Roman capital A, but no other A should be spread too much at its bottom part.

The law of proportion is one of the most important in sign lettering. While it is true that most sign painters never learned to make letters upon any regular geometrical basis, having copied the style of the one they learned under, yet it is best to understand how to draw by rule of measurement. If we should make every letter the same size the effect would be grotesque. Most letters differ in proportions as compared with the other letters of the alphabet. Taking the Roman letters, we find that G, for instance, will not look well unless the lower limb terminates at a point somewhat less than one-half the letter's height. Then there are certain optical effects to be considered, as where the bar connecting the two uprights of letter H is placed a trifle above the middle; or, more notably still, where the lower part of letter S is made larger than the upper part. The most graceful effect in the case of letter P will be achieved by placing the curved middle member at a point exactly mid-way of the main stem. When C and S occur in a line of lettering together with J, the latter should be allowed a good sweep, that it may in a measure correspond with the other two, in amount of horizontal space occupied. Letter S will always look better if the lower curve is made larger than the upper, as already mentioned. Take an "s" as it occurs in a printed page and turn the paper upside down; what in its normal position appeared

to be an equally arranged top and bottom member will now appear as a letter with an abnormally developed bottom section. The projecting limb of the letter R should be boldly rounded or the curve should end in a somewhat wide flat base.

The foregoing, and much more along the same line might be adduced, gives merely a hint of the importance of the law of proportion for lettering. The expert sign letterer knows from observation and practice how to treat each letter and other sign character, so that all parts may be in due proportion and produce a satisfying effect upon the mind of the reader.

· EXTENDED AND CONDENSED LETTER.—Certain letters are adapted to the lengthening process, while certain others are equally well adapted to shortening. If you wish a letter condensed, use the Egyptian, French Roman, and Half Block Letters. For an extended letter use the Egyptian, Block and Roman of various forms. The obvious purpose of an extended letter is to fill space; railroad companies use such letters on passenger cars. The condensed letter is used where space is meagre. It is not advisable to use either style excepting where warranted by circumstances. Never extend a letter more than 5-5, nor condense more than 2-5, taking a square of five by five units, as stated under title, *Correct Proportions of Letters*.

BLOCK LETTERS.—The letters having some oval lines, like O C Q, etc., should be made to conform strictly to the style to which they belong. That is, a full block O should have its corners made angular, not round. Some use the partly rounded with the full or partly full block, and while it is easier to form a rounded O, it is not good form to do so when the letter belongs to the full block style. Some argue

that where there occur several such letters in a line it is permissible; but not so.

In the C G and S, the spurs are made to show distinctly by extending the inside line a little beyond the body of the letter, then it is slightly curved back to the bar on the line. This is preferable to making a notch in the body of the letter to indicate the spur. But many otherwise good signs may be seen in which there are no breaks whatever in the line. But even this, harsh and unnatural as it may appear, is to be preferred to the notch in the bar.

SPACING LETTERS AND WORDS.—In the following line of letters is offered what may well be considered the most difficult combination of spaces placed together:

F T W A V L J P J L T T N

The letters A V and M have their heavy downward strokes 22 deg. out of the vertical, and the slight upward strokes 22 5-8 deg. For W the corresponding angles are 20 and 18 1-2 deg. Letter Y branches out 32 5-8 deg. to the left and the same to the right. The diagonal of Z and the heavy down strokes of K and X are 32 5-8 deg. away from the vertical. The cross bar of N slants 38 deg., and the light upward dash of K wanders 43 1-2 deg. from the heavy upright. These angles were found by carefully measuring 200 well formed letters with a projector, and taking the mean of these measurements for each angle.

When the spacing on a sign is not well done, it is at once apparent to the eye, and it is this circumstance that guides the expert in properly arranging his letters and words, as well as lines of letters and words, on the sign board. His eye measures distances very nicely, and his experience also tells him

just what space to give to a letter, to make it fit right in its place. It is true that his spacing is not absolutely correct, but the effect of the finished work is satisfactory to the eye, and what more can be asked or expected? Some contend against absolutely perfect spacing, as well as against absolutely correct formation of letters, arguing that it gives the work a mechanical look. Let each workman be persuaded in his own mind, but we would advise a medium course, not going too far in either direction.

All rules are subject to exceptions, and those applying to spacing in lettering share the common privilege. Long usage, however, has pretty well established the following rules:

In a line that is to contain a large number of letters, it is best to use a plain letter, which will afford more space than a letter of the opposite character will.

Ornamental letters require more space than plain letters on account of their seriffs or spurs.

In a short line of few letters a light and ornamental letter will look best.

The relative position of letters should be such that there will be about the same amount of space between each two letters. Thus, an A coming after an L, the two should be closer together at the nearest point than the two letters I and H.

The spaces above and below the line of lettering should occupy about 1-8 the width of the board, and the space between any two lines of letters may be a little narrower.

The space between words should be the width of one of the letters of average width; but sometimes the lay-out will demand more space than this; use your judgment.

Take the word TIT, and it will be seen that in

order to make it balance well the letter I will have to be pretty close to the two other letters. But the case is different with H I H, where more space may be given.

In KINGDOM the letter I may be closer to the letter K than to the N. The D a very little closer to the O than to the G. The O closer to the D than to the M. And so on.

All round letters should be spaced close, but square letters may be allowed more space. H, M, etc., are square letters. Open letters like A L T W Y, may be spaced close.

Never crowd letters, allow plenty of space around them, if at all possible.

A letter that is not to be shaded may be made somewhat thicker than one that is to be shaded.

PUNCTUATION.—Correct punctuation is always important, and while little of it is called for in ordinary sign painting or lettering, yet its laws must be understood if we are to make no mortifying blunders in our work. Formerly punctuation marks were used much more freely than now, both in printed matter, and in sign work. It is now the custom in sign work to omit all such marks where it can be done without violating the sense of the inscription. Judgment must be used in this matter, and wherever a mark is imperatively necessary it must not be omitted. This is rather superfluous, of course, as any intelligent letterer understands where to place a punctuation mark and where to omit it. However, not all are so able to do this. In some cases it is a matter for thought as to whether a mark should or should not be inserted.

CHAPTER III.

The Shading of Letters.



HERE are several forms of shading used by letterers, as follows: The *Relief Shade*, in which the shadow is cast away from the letter, leaving a space between it and the letter. It is more used than any other shade. The *Close Shade*, in which the shade is a part of the letter, forming a solid block. The *Double Shade*, in which there are two close shades of different tones of the same color. The *Drop Shade*, in which the shade drops below and away from the letter, as in relief. The *Double Relief* shade, which is composed of two relief shades. The *Blend Shade*, which is used on an outlined letter, which is shaded with several colors, which are then blended together; on the outer edge of the letter is another outline like that surrounding the letter itself.

The purpose of shading a letter is, primarily, adornment or style, but it also serves the more practical purpose of filling superfluous space. Shading is not used so extensively as once it was, and this because a more attractive sign may be made with the ornate French letters, which need no shading and could not take any, owing to the lack of thickness in that letter. Still it can serve a purpose, as in filling space, it is useful.

Shading is done at an angle of 45 degrees, and usually is placed on the left-hand side, though some prefer it on the opposite side. In the former case the bottom is shaded, and in the other case the top is shaded. While there is no set rule for placing the shade, yet

there are more good reasons for placing it on the left-hand side than on the right. The construction of some of the letters will show that to shade on the right will involve more work than when done on the other side.

The *Block* letter lends itself easily to shading, as no other letter does. The practice of shading originated when sign letters were first made from blocks of wood, and the shade represented the block of wood; it did this in two ways, first, by representing thickness, and secondly, by representing a cast shadow from the block of wood, or whatever material the letter may have been formed from. Hence, we have the blocked letter, with the shade joining the letter, and the shaded letter, with a slight space between the letter and shade. As a rule it is better to leave some space between letter and shade, owing to the fact that the shade is commonly, if not always, a light tone that loses color value by joining the letter color, which in turn also loses something in the same manner.

In shading letters we are supposed to follow natural laws governing light, and hence we must understand these natural operations, if we would have our work conform thereto. Here are a few suggestions that will be found helpful in this connection: Natural shadows are sometimes lighter than the objects casting them. This is particularly true when the objects are in a certain position. In objects exposed to the sun's rays there is a heavier shade under horizontal projections raised from the ground than on their sides, so that in letter shading, when it is desired to cause the letters to appear raised, a shade a little heavier than that of the perpendiculars is placed at the bottom. The breadth of a shade should balance the body of a letter. A shadow too broad or too heavy will detract from the appearance of the letter. The shade had better be too light at the

start, and then be worked up gradually to the full effect by shading.

The color of a letter that is to be shaded should be made to agree with the color of the ground-work. Certain color shades are thought to be suitable for any color ground, as for example the following mere glazes of Ivory Black, Vandyke Brown, Burnt Umber, Asphaltum, and Burnt Sienna.

In some certain positions, as on the concave lower side of a street car, letters shaded to the right seem to be better than those shaded from the left-hand side and on the bottom. This because, probably, we look down on the letters, but at the same time it is not in accord with natural law.

An easy way to draw the shade lines is to first form the letters of cardboard, lay these on the sign, draw their outlines, forming the letters proper, then drop the cardboard down to the right a sufficient distance and draw the lines there. Connect the open or unconnected parts with the pencil, and the form of the shading will be correct.

To make a painted letter appear to stand out in relief or appear incised requires skill, as any displaced shade will spoil the job. Keep in mind the point from which your imaginary light comes, and you will not go far wrong.

The shading of a glossy letter should be flat.

Lettering done in connection with fresco work should be shaded in flat color, the letter being flat color also.

Red letters look best in glossy color, and should then be shaded with flat color.

All dark color letters look best in gloss paint, while all light color letters appear best in flat color.

Hight-light gold letters with Naples yellow, or white tinted with chrome yellow.

Vandyke brown and white, tinged with a little blue, gives a good shade for black letters.

The shade for a black letter on a white ground may be any light tint of green, blue, red, or buff; but the color most used is a stone or lead color, of rather light tone.

For shading black letters on white ground do not use white lead and lampblack, as the custom is, but tone the white with a trifle of yellow ochre, or use ivory drop black with the white, which gives a better shade color than lampblack.

One rule is to make the shade for a letter from the color of the letter combined with white, so that a black letter would have a warm gray shade, while a red letter on a pearl ground would have a shade of a delicate tint of cool gray.

A black letter on a white ground will appear distinct enough without shading or lining, and the same with a white letter on a black ground. But on a colored or tinted ground the letter should be outlined or shaded with a color slightly darker than the ground, but of the same general tone.

With a gold letter or white letter on a light blue, gray-drab, etc., it is necessary to shade a letter close to its edge, in order to throw it out more distinctly.

A second shade should always be of a warmer tone than the first shade.

The depth of a shade should show merely as a shade; observe this rule particularly when making more than one shade to a letter.

When the ground is darker than the lettering the shade should be two or three shades darker than the ground, unless the latter is black, in which case the shade should be some bright color, a line or blended shade, the most difficult of shades to make. This must

be a close-shade, touching the letter, or at most not standing away from it.

The depth or width of a shade may be one-fifth of the member that is shaded, though this is by no means a hard and fast rule, for the shade may be heavier or lighter, according to taste or circumstances.

Some make the bottom shade a trifle heavier than elsewhere, to compass an optical effect, whereby the letter seems to have a better foundation.

The space between letter and shade should be in the proportion of $\frac{3}{8}$ inch for a 6-inch letter, and $\frac{5}{8}$ inch for a 12-inch letter. This is not an inflexible rule, however.

Leave a space of ordinary width between shade and letter, excepting where the letter is of a light color on a ground not dark enough to show unless the shade is close to it.

Shading on a blue ground, make the shade about three times darker than the ground, tinting it with a little red, to warm it up. For a second shade and the darkest one use Vandyke brown or Indian red in the blue.

For some kinds of signs a shade of vermilion, darkened at the bottom with some brownish-red, Indian red, for instance, is allowable; but on a white ground with a black letter all gaudy coloring in the shade is to be avoided.

A fine effect may be obtained by running a line of color two or three shades darker than the shading color on the inner side of the shade, next the letter, leaving a blank space as usual.

As shadow is less than substance, the shade of the letter should be lighter than the color of the letter. The shading should be one that will harmonize with the color of the groundwork, and it should not be too strong.

When shading a gold letter on a white ground use carmine for the deeper shade, and light English vermilion for the light shade.

The various shades of green offer pleasing contrasts in shading gold on white. In touching up, verdigris is fine for the darker parts.

Blue always appears well in contrast with gold and white.

The shading color for glass should be made elastic, otherwise it is apt to peel off.

A good black for shading on glass may be made from the best refined lampblack and a little boiled oil, ground under a palette knife on a stone slab or marble; add a little rubbing or spar varnish also.

A good thinning fluid for letters that are to be shaded is boiled oil and a little gold size; for the shading color use turpentine and a little raw oil. If you use an oil color for the shade then omit the oil; if a japan color, then add a little raw oil.

For shading on glass, where a brown is desired, one that is not too dark, use an olive-brown shade, which is rich and effective. For a darker shade burnt umber and Vandyke brown are very rich browns. In shading on glass use white lead as far as possible, avoiding japan colors. Never place japan color on a varnished surface, for it will eventually show fine cracks, owing to the unequal drying of the two materials. Give all color ample time for drying before applying any other coating over it. Never apply the backing-up varnish or color for a week after shading.

CHAPTER IV.

Scroll Work in Sign Painting.



HE laying out of a sign embraces the arrangement of the lines upon which the lettering is displayed. In this direction opportunities for the display of taste are unlimited. While it is true that in many cases a writer is compelled to arrange lettering in straight lines, as a rule, a good workman prefers to make a liberal use of curves. Besides being more pleasing, such an arrangement is more effective, as it permits the writer to bring out or subdue words according to their importance, and still preserve the balance of the sign as a whole.

When one departs from purely horizontal lines in the lay-out of a sign, a new element is introduced, namely, the necessity of balancing the whole, and filling intervening spaces by flourishes or scrolls. To an experienced hand scrolling is simply a matter of a few touches with the pencil, yet it takes much study and practice to acquire a good style of scrolling. A beginner will do well to study critically the best examples he meets, for it is by this means, more than any other, that good taste is acquired.

Scrolling is almost entirely a matter of taste and judgment, and it is, therefore, rather difficult to lay down rules for the guidance of a beginner; but an important feature to remember is that scrolling is only used to set off lettering. The more sparingly it is used the more effective the sign will be. In most forms of scrolls the lines should flow gracefully into one another, on the principle of radiation. Briefly, this is when one line approaches another, if continued, it should not cross but flow into it at a tangent. This is a simple

principle of practically all the scrolling used in connection with lettering.

In arranging letters on a curved or sloping line there are two ways of making them. One way is to draw the uprights of letters vertical; that is to say, making all upright lines parallel with the upright edges of the board. The other is to bend the letters to the shape of the curve upon which they are drawn. The second method is as though the lettering was actually on a curved ribbon. Where lettering is used on a painted representation of a ribbon, the latter plan is the better. In a sketchy lay-out where no ribbon is actually suggested, all uprights kept vertical give a very pleasing effect.

Naturally, the style of scrolling used in connection with lettering must be in keeping with the character of the letters used. In bold, heavy lettering, the scrolling, lining, or ornaments should be in keeping. Finally, in making scrolls it should be remembered that almost all forms used are based upon familiar ornamental forms, which, in their turn, embody structural features found in flowers and plants.

SCROLL WORK.—Scrolls and flat ornaments are very useful in fine sign painting, and while any style may be used, the Rococo is the most suitable for flat part-relief and flat work. For other work use the Roman scroll, the finest of all. Draw your scroll or relief on the board with care, and show all the shadings, etc., to guide in the finishing touches. It is well to fix the drawings with thin shellac sprayed on. The scroll may be gilded solid, and when dry give it a coat of varnish. When dry, paint in the lightest shade color, and after this has set, apply the next shade of color, and thus proceed until the shading is complete. Use transparent tube colors. These embrace burnt sienna, asphaltum, gamboge, yellow lake, Dutch pink, verdigris, carmine.

Vandyke brown and orpiment. Thin with good finishing varnish. High-light with Naples yellow, or light and medium chrome yellow. After the work is done let it stand a day or so, then varnish. For work in oil color, use tube colors, and make the work opaque, not using transparent color as with work on gilding. Have the colors required on a palette, and thinning material also on same.

TO SHADE GOLD SCROLLING.—Take equal parts of asphaltum varnish and brown japan, add them together; then add a teaspoonful of burnt sienna, in oil; shake together. Varnish and rub the gold before applying the shading, or the shading will be muddy. Also, dilute the shading color to tone required. The varnish prevents the shading from striking in, and the sienna gives the shading a rich gold tint. Transparent washes of ultramarine, carmine, verdigris, lake, etc., also are used on gold scroll work. In shading the scroll three washes may be used to produce a fine effect, the first very thin, the next being placed partly over the first, and the third deepening the shade.

To glaze aluminum leaf to a golden shade, take French yellow lake, ground in varnish, thin with pale coach varnish, and add a few drops of turpentine.

OIL SIZING LETTERS AND SCROLL WORK.—For sizing letters and scrolls, especially the latter, instead of using the gold size as it comes from the can, thin down with turpentine and keep it in a bottle, well corked. A number of very good workmen use their size too thick, which causes the work to stand out from the surface, and where the work is to be varnished and rubbed down smooth, as is sometimes required, there will be trouble. As scrolls are complicated in design and must be sized in one stretch, the size should be applied very thin and smooth. Size for script must be pretty thick, to prevent spreading.

CHAPTER V.

Forming the Ellipses, Oval, Curve, Circle, Octagon,
Star and Horizontal Line.

E are apt to get terms confused here, the term *oval* often being applied to an oblong rounding form that is really an ellipse. An oval is egg-shaped, the word being derived from the Latin *ovum*, egg, and which is larger at one end than at the other.

There are many ways of constructing an ellipse, many of them too complicated to be practical, and most of them are mere approximations. Here is the way one sign painter describes the method:

"If you want to make an oval 3 feet by 2 feet, draw a horizontal line 36 inches long; mark the center, which is 18 inches from each end. From this point draw a vertical line 12 inches long. Now take your rule and place the end of it at the vertical line, and the 18-inch mark on it; wherever it strikes on the horizontal line mark it with a tack. Now make the same measurement on the other side of the vertical line and mark that spot where the 18-inch-point of the rule strikes the horizontal line with a tack or a pin, also the end of the vertical line the same way. Now tie a piece of twine that will not stretch around the three tacks; pull out the tack at the end of the vertical line and put your pentil in its place. Now run your pencil around the string, keeping it taut, and you will be able to scribe a complete oval, 24 by 36 inches. By using this method any shape oval can be made; and remember that half the

length of your oval is the measure from the outside end of the vertical line to the horizontal line. The horizontal line represents the full length of the oval, and the vertical line half the width of the oval."

Methods for drawing the ellipse call for the employment of the compass or dividers, but a true ellipse cannot be made in that manner. The result would be simply an approximation. Some have employed a series of tangents, the results in some cases being erroneous, while in others they have been perfect, but such methods are too cumbersome for practical use. They are ingenious rather than practical. The string, pencil and two tacks will be found the most useful method for painters.

An instrument called a trammel consists of two pieces of wood with grooves, these crossing each other at right angles, midway of their length, where they are fastened. Take another piece of wood and at a point one-half the width of the desired ellipse from one end place a pin or peg, and at the point distant half the length of the desired ellipse place another peg. Hold a lead pencil at the end representing the half of horizontal line, and with the pegs moving in the grooves move the pencil and stick around, rescribing a true ellipse. You may use any kind of sticks, even boards, if the ellipse is to be quite large; the grooves may be made by tacking on strips of wood.

FORMING CURVED LINES.—The sign painter forms whatever curved lines he may require on a sign board by free-hand, as a general thing, or where the curve is not extensive or demanding exact lines. But he needs some mechanical help when laying out a sign on a wall or other similar surface, and this he does by means of a piece of twine of sufficient length, holding or fastening one end of it at the bottom, according to whether

the sign is a very large one or comparatively small, and with the other or right hand and a piece of chalk or charcoal together with the line describing the curve as desired. Take, for instance, a long and low wall, and if you wanted to run an arching line at the top it would be necessary to get down into the earth far enough to allow you to run the curve with the straight piece of twine, and hence some more practical means must be used. The way to do it is as follows: First draw the lay-out of the sign on paper, to the scale of say an inch to the foot, and then enlarge this on the wall. That is, you mark the paper off in one inch squares, and the wall in one foot squares.

LAYING OUT A STAR.—A star within a circle is frequently used in board advertising, and where such a device is called for, the star may be made by first laying out the circle with the large wooden dividers, then measuring off its circumference into five equal parts, making a dot at each place. Now run lines to connect up the five dots, say the top one is marked A, which letter I use merely for illustrating here. Going on the right-hand side of the circle we come to the next dot, marking it B. Then we proceed around the circle, in alphabetical order, A, B, C, D, E; then we run a line from A to C, thence to E, thence to B, thence to D, and finally up to the starting point, A.

To make it a double star, make a dot in the center of star, and run lines straight out to each dotted point on the circumference, or through the middle of each ray of the star. Then one side of each of these divisions may be shaded.

MAKING A LARGE CIRCLE.—Circles of any desired size may readily be formed on a wall of bulletin sign by driving a nail in the center and attaching a twine to it, on a loop, then with a crayon in the right hand

grasp the end of the twine and so describe the desired size of the circle. Very large dividers are made for scribing circles, with the two arms of wood, terminating at the free ends with sharp pointed irons. These are indispensable, almost, where large work is done.

GETTING A LEVEL HORIZONTAL LINE.—If you want to run a perfectly level horizontal line on a wall and have no spirit level with you, take a plumb bob and line, which may be formed from a bit of stone or almost any old thing, and a piece of twine, and get a true perpendicular line on the wall. Mark it there, and with the dividers describe two small circles, center on the perpendicular line, and just far enough apart, one above the other, so that they lap a few inches. Now place a straight-edge across the lapped circles, exactly at the point where each crosses the other, and draw a line there. You will have an absolutely perfect level horizontal.

TO DRAW AN OCTAGON.—By drawing a square of the desired size of octagon, then upon this, drawing horizontal and perpendicular lines through the center, with diagonal lines from corner to corner; then scribe a circle the exact size of the square and the points where the circumference of circle meets the dividing lines inside square will be the points of the octagon.

This simple method gives exact results upon any size of figure and is the easiest to remember and apply of any rule for this purpose.

CHAPTER VI.

Wagon and Railway Car Lettering.



WHILE many sign painters do wagon lettering, very few vehicle painters do it, for the reason that there is comparatively little of it to do; in shops where new wagons are built and old ones renovated and repaired, the lettering is done by some sign painter who comes and does the work when sent for, and sometimes such a sign painter will have the lettering for a number of such shops to do; in some cases the shop may have work enough to keep a sign painter busy, as in those shops where firms using a large number of wagons have their vehicles built and repaired. Some of these wagons are beautifully painted all over the sides, and often the sign painter or letterer is a pictorial painter of no mean artistic ability. I have seen such work done, and many specimens of this kind may be seen on any city's business streets.

The style of letter employed on wagons is in some respects different from that generally seen in commercial signs. As a rule, it is more or less an ornamental letter. The severely plain letter, like the block, unless shaded and colored more or less elaborately, is not as a rule seen. Where a very plain letter is used it is generally a very fine one, Frenchy, as the saying is, or built on fine lines.

Speaking upon this subject, M. C. Hillick, author of *Practical Carriage and Wagon Painting* (1900), says:

"Perspective effects, heights, widths, thickness of lines, etc., because of the usually generous sweep of

space at command, as secured by the sign writer, do not come within the scope of the wagon letterer's activity, save in rare instances. Ordinarily, wagon spaces to be lettered are of dwarfed dimensions and quite commonly cast in irregular outlines. In wagon lettering, whenever possible, the extended letter frequently has the preference. An able and widely observant critic says it might be said that the customary speed of a vehicle can be measured by the degree of elongation which the letterer gives to his work, the lightning express car representing the ultimate in one direction, while the mammoth furniture van, with its high art panels, is characteristic of the other. The chief distinguishing feature of wagon lettering, as contrasted with the average results of sign writing, is found in the wider variety in elegant color effects to be remarked of the first named. The wagon letterer essays glazing with many of the beautiful transparent pigments, and in this wise brings forth charming combinations in color seldom attempted by the sign painter. The wagon letterer's work is as a rule done with quick-drying colors or size, and almost invariably is varnished over. Surface smoothness is therefore with him a matter of first importance. The art of the wagon letterer is full of difficulties."

In shading letters on a wagon the rule is to let the shade touch where gold, silver or aluminum is used, making what is called a "close shade;" whereas, if the lettering is done in color there should be a little space between shade and letter. Gold letters on black or white ground may be shaded with almost any color but a yellow, which approaches the color of gold too closely to avail as a shade. For gold lettering on a colored ground use rich reds, greens, blues, or umber shades. For instance, take a rich green ground, a

gold letter, and a rich red shade. Or a red ground, gold letter, and rich green shade. Black letters do well shaded with almost any color, particularly in the primary series.

Spacing and punctuation are followed in wagon painting as in general sign painting. The alphabets used are mainly ornamental and specially adapted for the work; there are hardly any limits to the ambition of the sign painter in this direction excepting such as he may choose to fix for himself. While severely plain letters do on a wagon, yet very ornamental lettering is equally becoming.

LETTERING PANELS ON WAGONS.—Lay out the letters on one panel with chalk, then apply a sheet of newspaper against the inscription, pressing it out gently yet firmly, using a soft cloth for the purpose. Before removing the paper make marks to register it, if you cannot take the whole inscription at one time, so that when you come the second time you can place the paper exactly where it will take up the design where you left off the first time. Take the paper over to the opposite panel, and press it gently against the panel, which will transfer the design in chalk to the surface thereof. Repeat the operation until you have the entire inscription transferred. The use of this process is obvious. It will save you the time required for laying out the second panel, besides giving you a correct duplicate of the first or original lay-out. If several wagons are to be lettered with the same inscription it will be best to make a stencil pattern, which may be done by coating manilla paper on one side with japan black and when it is dry press the black side against the chalked design on the panel, and then prick out the pattern, with a pin or with a tracing wheel.

LETTERING A DIAGONAL PANEL.—When you letter

on an inclined plane, as on a diagonal panel, slant the lettering towards the highest part of the panel.

MAKING SKELETON LETTERS.—To make a skeleton letter, let the line be on the basis of $\frac{1}{4}$ inch for a 6-inch letter, and $\frac{3}{8}$ inch for a 12-inch letter. Fill the inside of the letter with any color or tint that will agree with the other colors used. This may be lined the same as the outer edges of the letters, and the work may be done in gold or in color. It requires skill and care to produce a fine type of skeleton letter.

DECALCOMANIA LETTERS FOR PASSENGER CARS.—These letters are very useful in lettering passenger railway cars, but they have their limitations also. At first glance it might be thought that they would be cheaper than the hand-painted work, and that almost anybody could apply them, but this is not the case at all. The first coat of decalcomania letters is greatest, so that where only a few, or comparatively few, are used the cost places them very close to hand-painted work, there being no standard letter that would allow the manufacturer to make a large number of them at one time, and in addition to this the number of passenger cars on most lines is not large, and gold letters last several years. Only the great trunk lines would be able to use this letter economically.

Nor can these letters be placed by unskilled labor. It requires skill and accuracy to apply transfers in line, to put them on right and rapidly, too. This is particularly true where the letters happen to go over beaded work with deep grooves. Where a large number of letters can be used the process is much more economical than hand-work. But when large plain letters are used, without shading or edging, which condition applies to most passenger car lettering, an expert sign painter can put the letter on with his brush almost as

rapidly as the man with the transfer can do it, especially over irregular surfaces.

In a report on this matter, made at the convention of master car painters, it was said:

"The almost universal use of gold leaf letters on the exteriors, however, brings out one of the main objections to the use of transfers for this work. The decalcomanias I have experimented with are imitation gold made by applying a glaze over silver or aluminum leaf, and while they match the gold leaf closely at the outset, they do not stand the weather exposure and soon fade, or change color and lose their richness, and after a year's exposure do not compare favorably with the gold leaf, as the latter will wear for years without changing.

"Decalcomanias may be used to advantage in many places, and with economy when several letters can be applied from a single transfer. They are also suitable for all kinds of interior work where they do not get the weather exposure. As a rule, however, we do not think transfers can be used to advantage for lettering the exterior of passenger train cars, because of the difference in style and size of letters now in use, the small saving effected, the difficulty connected with their application over a beaded surface, and the fading of the imitation gold leaf."

Decalcomania letters may be used on doors, water coolers, etc. There is no question about their value for interior work. They are not fit for outside lettering, they will crack in warm weather, while there is difficulty to get them to lie flat, or to go into and over mouldings.

For small signs, name plates, and the like, they cost much less than hand-work, say $6\frac{1}{2}$ cents as against 75 cents in favor of the transfers. One painter says that he did nine cars with them, and that the cost was less than the cost of the gold leaf.

CHAPTER VII.

Brushes and Lettering Pencils.



HERE are certain brushes used in sign work that should be of the very best quality, and at the same time there are some that may well be of a cheaper sort. The usual brushes used in lettering are made of camel's hair, and either red or black sable. The so-called French camel's hair brushes are the best for all purposes, being a little stiffer than the common kind. Sable brushes are too stiff for some kinds of work, but are handy for putting on size and for similar purposes. Red sable brushes are more pliable. The letterer should have a good stock of pencils on hand, all convenient sizes. The cost will amount to a little at first, but properly cared for pencils will last a long time, and earn many a dollar. Buy them in dozen lots at least. Handles also may be bought, and experts consider the handle for the pencil a necessity, justly claiming that nobody can make a satisfactory or true curve without a good, true round handle, of the required length. A distinction should be made in the color of the handles. For instance, red sable should have red handle; common camel's hair, green, and French camel's hair, yellow. This will enable you to tell at a glance which brush to use.

Sable pencils always prove the most satisfactory for general use, although for glass work, etc., where light-weight colors are used, the camel's hair pencils are used very extensively, many preferring them to any other, after they become accustomed to using them, while for

general filling in, etc., the bear hair and ox hair brushes are always satisfactory.

The two-inch camel's hair brush is used for applying water size, for gilding on glass. This brush is generally called camel's hair mottler. There is on the market what is called the sign-writer's one-stroke brush. You will find this brush the most satisfactory for making advertising signs, as it is a great time saver. Camel's hair tips, two inches wide, are the best for laying gold leaf, while the badger hair tips are the best for laying silver leaf. The two and one-half inch is generally preferred.

It is important to take good care of tips; keep the hair straight by combing them out occasionally with a common hair brush, and when not in use keep them between the leaves of a book, being careful to have the hairs straight. Naturally much depends on the proper care of these goods. Lettering pencils and brushes should always be washed out clean before laying away. A good method to keep pencils that you are not using is to wash them out with turpentine when through working, and grease well with lard oil.

Brushes will be made up by most makers, as a rule, of any desired length of hair. The difference between ox hair and black sable consists in the former being stiffer and less resilient than the other; the black sable is very soft, pointed and resilient. Black sable is used mainly for lettering on glass. Ox hair is used on board, card and oil cloth lettering. Black sable is made up in pencil form only. Ox hair is used for making pencils, one-stroke, and sign painters' brushes. Black sable hair is finer and costlier than ox hair. Where ox hair proves too coarse the maker will make up a mixture of hair that will give you a cross between the soft sable and stiff ox hair.

The length of hair for heavy colors should not exceed one inch. The red sable pencils, intended exclusively for lead pigments, may well be $\frac{3}{4}$ inch in length. For large letters, with extended bars, the pencils handle best at a length of hair of $1\frac{1}{2}$ inches. Truer lines may be drawn with the pencil of longer hair, as the hand tremor is less perceptible and the color is laid with a finer edge. It is advisable to have a part of the black sable pencils furnished in $1\frac{1}{4}$ inch length and part in $1\frac{1}{2}$ inch. The camel's hair pencils may be likewise advantageously divided into the two lengths noted. The chief drawback to be noted in respect to pencils with the hair set in quills is that in course of time the quills become dry and crisp, and then crack open, necessitating constant repairs. To fit the handle into the quill pencil, steam the quill until it becomes soft and expansive; then force the handle firmly into the quill and stand aside to season out. The principal feature of a first-class pencil is this: when put in turpentine or paint, it should offer a fine point, and when applied to the surface this point should become square. Every experienced letterer or sign writer is alive to the pleasure of working with a pencil that lays out square at the end, and with which corners, right angles and easy sweeps are handily executed.

The elasticity of a pencil is an important item. The live, vital, springy, perfectly elastic hair in a pencil should, when withdrawn from the surface, assume a straight, shapely position, and the point of elasticity in a strictly first-class pencil will be at about the center of the hair. The pencil that must be loaded with paint at base of the hair—this paint then being allowed to dry, in order to strengthen or stiffen it sufficiently to prevent it from becoming "slimpy" and warping out of shape—is of no value to the letterer. An artificial elasticity

cannot be made to do duty in a lettering pencil. In the selection of camel's hair pencils, one cannot easily be over particular. As a rule, camel's hair pencils do not average as uniform in quality as the sable. One pencil may have the elasticity of a spring-tooth harrow, and the next one, equally promising in appearance, may be as lifeless and "floppy" as the housemaid's floor mop. It is very much akin to a game of chance to pick good pencils from a box containing the fleece of the meek and lowly camel. It is the lucky purchaser, indeed, who does not draw quite numerously of the worthless kind. In selecting the camel's hair pencil, whip the hair over the forefinger, and note the amount of elasticity displayed. The hair should have a rebound and a property for holding itself in shape against even rough handling, and when this is evident the buyer need entertain no fear of the pencil as a useful tool.—M. C. HILICK.

CARE OF BRUSH AND PENCIL.—In the days when I had the care of a shop and a force of men, a precept was "Never get in too big a hurry to take good care of your tools." For many years I have given my black and red sable, ox and camel's hair brushes, scroll and striping pencils a good washing in turpentine, benzine, or gasoline, whichever was most convenient, preferring turps; then use some non-drying oil, preferably lard or neat's foot, for summer, and olive or nut for winter. I dip the tip only in the oil, squeezing it with thumb and finger back into the heel of the brush; then I take some clean, soft waste, or fragment of old gauze underwear, and wipe the oil out of it. I have a narrow pasteboard box into which I throw them, heads all one way. If I am using a number of them where I have no oil handy, I wash them out and throw them into the box with the heads in the opposite end, so that I never have any

trouble telling which needs oiling. Brushes kept in this way will last almost a lifetime, if not worn out. They will not remain crooked when kinked, and are ready for use without rinsing.

Bristle tools for landscape, figure, bulletin or other pictorial work should either be wiped as dry as convenient by brushing, or washed in benzine or gasoline, then washed with any good soap and rinsed in good clear water.

Ox or camel's hair tools may be treated in the same way with good results. It is about the only way to keep bristles soft and pliant, especially those which have become more or less worn.

A good way to keep the brushes used in the necessary surface work is to wrap the brush with a piece of paper of suitable size to cover the stock, around which it should be closely wrapped, extending far enough beyond the point of the brush to turn back and enclose it completely; then place in a vessel of water as usual. Brushes in all colors may be kept in the same vessel, and as long as there is any water in the can the paper will keep moist and preserve the brush. Besides, the brush is not filled with water, as it would be if immersed, and it is all ready for use without anything more than a slight swing to throw off the few drops of water which may settle in the point of the brush.—
W. T. HUBBELL.

When not in use, grease the pencil with a mixture made up of two-thirds mutton tallow and one-third lard or common vaseline. The tallow is a little too hard when used alone, but with the lard or vaseline it is sufficient soft to work into the pencil nicely, and at the same time hold it perfectly in shape. Some workmen claim it to be the best way to flatten the pencil in greasing, and to so leave it; but a majority of sign writers and

pencil hands generally are, we believe, agreed that, after working the grease thoroughly into the hair, the pencil should be rounded out and drawn to a tip. This is the most natural form of the pencil, and holds the body of the tool to its truest lines. As a very delicately-adjusted tool, with an organism extremely sensitive, the lettering pencil should not be pasted against the window glass nor left in any position where it may be reached by dust or uncleanly accumulations. A dust-proof pencil holder, made of japanned tin or wood, long enough to take the pencil and its handle intact, and small enough in bulk to be carried in the coat or hip pocket, is the most convenient pencil keeper.—M. C. HILICK.

VARIOUS WAYS.—The painter will have his own way for keeping his lettering pencils and brushes when not in use, and the following represents a few of these methods:

It is a good plan to grease a pencil before using it, when it is new, straightening it out on glass and keeping it there for a week. This will establish the hair in the proper form.

Vaseline is good for greasing pencils with, but there are cheaper things, such as petroleum jelly or cosmo-line, the latter costing 25 cents per pound.

Have neat's foot oil on hand, dip the pencil in this before laying it away. The oil prevents drying of any linseed oil in the heel, and is easily washed out with turps or benzine.

A painter claiming thirty-five years' experience says that the best way to clean out a pencil is to rinse it in turpentine, then work it in fine dust or ashes, then shake it out well.

CHAPTER VIII.

The Correct Use of Color in Sign Work.



THE sign painter should be a good colorist, as well as a good letterer. When the board is painted a pure white the lettering may be almost any color one may choose, and it will look right. And the same rule holds good with a black ground. This is in accord with the rule that black and white agree well with all colors, even causing discordant colors, when joined together, to appear well when placed so as to separate them.

The following little and far from complete table will be of some service in this connection:

Ground Color.	Lettering Color.	Shading Color.
Stone Color.	Black.	White & Dark Stone.
Black.	Any Color.	Any Color.
White.	White or Gold.	Plain.
Light Blue.	Dark Blue & Vermilion.	Black & Med. Blue.
Bronze Green.	Gold, Yellow & Red.	Emerald Green & Vermilion.
Marble	White Incised Letters.	Various.
Mahogany Graining.	Any Light Color & Gold.	Various.
Walnut.	ditto.	Various.
Dark Oak Graining.	Gold or Red.	Dark Color & Black.
Light Oak Graining.	White.	Black.
Chocolate.	Pink, Salmon, Rose.	Letter Color & Black.
Dark Blue.	Gold, White Outline.	Plain.
Medium Blue.	Gold.	Orange and Vandyke.
Vermilion.	Gold or Yellow.	Green, White, Black.
Sage Green.	White.	Purple, Brown, Black.

Here is a very neat and suggestive combination of colors: Make the ground a rich leather color. Letter in gold, with two narrow raises of black, and one of transparent color, umber. Or, a stone color ground with incised letters. Or, Emerald green ground with countersunk letters of pure white, with a gold line around them, raised with burnt sienna

and white blended, and a cast transparent shadow of a deeper shade of green. Or, as an alternative suggestion, a cream ground, gold letters, raised with two blues and a white and a cast shadow deeper than the ground. These are suggestions, indicating what may be done in the way of fine coloring in sign lettering.

SOME COLOR NOTES.—Gold appears handsome on a blue or red ground.

A tinge of blue in white lettering color on a black ground will increase its strength.

Light blues, pinks, greens and purples are not suitable for ornamental work on signs.

The field of a sign must not be florid, for that will detract from the beauty of the lettering.

Dark colored letters look best when glossy, and light colored letters look best without gloss.

Lettering in connection with fresco work should be without gloss, so as to harmonize with the flat effect of the fresco.

Flashy colored grounds are in bad taste. They are all right for very cheap grades of work.

The color of the lettering should be in strong contrast with the ground, in order to secure perfect legibility.

A badly colored sign will look vile, no matter how well the lettering is done.

Certain colors, when grouped together, will either make or mar a sign. The choice of color is very important.

As a rule light letters on a dark ground look better when close together, for the reason probably that less of the background shows. A pleasing and compact effect may be had by drawing outlines close together and filling in intervening spaces.

Have the tones of your reds, blues, greens, etc.,

well balanced. When you require a red, select the right one. If you need a bright red, be careful not to select a fiery red, or if a warm red is called for, see that it is not too dull. This is well to apply to the choosing of all colors. Get the right tone.

For a delicately tinted ground have very delicate color for the lettering. Avoid harsh coloring.

If you have a silver-gray ground and the letters are to be shaded, put in a line of white between the letter and the shade. If the ground be made from white tinted with ochre to a delicate shade, then put in a bright straw tint. Such little touches as these add wonderfully to effect.

CHAPTER IX.

The Pigments Used in Sign Painting.



THE pigments required by the sign painter comprise most of those in use by the house painter and decorator, but for some purposes they must be of a much finer quality than the latter demands. The white lead must be pure and very finely ground, and white. Many of his colors may be those sold in tubes, as being finely prepared and more economical in use. He will need these pigments on his shelves, while others he could manage to do without: Yellow chrome, Naples yellow, flake white, yellow ochre, sienna, Indian red, vermilion, crimson or scarlet lake, rose madder, ivory drop black, lampblack, Prussian blue, ultramarine blue, and emerald green. Added to these are pure white lead and zinc white of the best quality. Some of the pigments will be required ground in oil, some in japan or turpentine, and others in water, for card and muslin work.

The following brief descriptions of the whites, blacks, blues, reds and yellows will be found useful:

THE WHITES.—Pure basic carbonate of lead, or white lead, ground in oil, is used in large quantities by the sign painter, chiefly for grounding in his sign boards, and it must be of the best quality, white and finely ground in oil. Excepting for wall and other cheap work, he has no use for compound or imitation leads. Sometimes he adds zinc white to the lead, to get a whiter surface. Flake white in tubes is best for lettering with; flake white being a superior form of lead carbonate. It has good whiteness,

and covers well. Zinc white may be used in its place for some work, say where the work is extensive, or not demanding the finest coloring. The best medium for thinning white paint is a mixture of turpentine two-thirds and a good colorless copal varnish one-third.

THE BLACKS.—Of the whole black family ivory drop black is the purest and deepest in tone. It demands very careful grinding, and owing to its hard, dense nature the grinding is not easy. For sign painting it is best ground in turpentine, gold size, and a little varnish to bind it. With an excess of turpentine as compared with a binder the color is very likely to rub up. Lampblack is rather more durable than drop black, and should be employed where great durability is demanded. Drop black may be added to it in certain proportion, deepening its color. This would form a sign painter's lampblack, and will be found useful for general uses.

Lampblack is of a greasy nature, which works against good drying, hence requires more driers, this operating against its durability by injuring the oil in it; nevertheless, lampblack lettering will stand long after the white lead ground has weathered away. The grease may be removed by calcination; add some alcohol to a quantity of it, in a shallow vessel, set fire to it, and when the fluid has burnt out the black will be free from its grease. This will not injure its color, but improve it, giving it better covering power and causing it to spread better. Such a black is useful particularly where a sign is to be done in dead black lettering.

For water color work lampblack may be cut with vinegar or alcohol. For muslin work it may be thinned with benzine. For some purposes the lampblack may be mixed with benzine or turpentine to a paste.

then add a little raw oil from time to time, very gradually, and work the mass to a condition approximating that of not-hard butter.

THE BLUES.—The coloring power of Prussian blue is very great, but it is weak in stability, changing color. A sign painter says that his best results with this pigment come from adding a little zinc white to it, lettering with this on a zinc white ground. To prevent Prussian blue from spreading, add a little lime-water. Ultramarine blue is the only blue that will stand outside exposure. For shading purposes we may darken ultramarine blue with Prussian blue, or with black. Ultramarine blue is one of the most useful pigments the sign painter has at his command.

THE REDS.—The sign painter is fortunate in having for his use quite a large family of good reds, a color that is very much used by him. Indian red is a good wearing color, and finds many uses in general sign painting. It is useful also for toning down vermillion, and by itself it is very rich and effective. Of the vermilion, Chinese leads, though English vermillion is used most extensively, being very satisfactory as regards color and permanency, and much cheaper than the brighter and finer Chinese article. The darker crimson shades of English vermillion are the most durable, and for this reason are the most employed in sign work.

Chinese vermillion seems to improve with age, after its application as a paint, and it is particularly good for lettering on a white ground, in this respect being equalled by no other pigment or color. It greatly brightens a job on which it is employed, owing to the peculiar brightness of its tone. Quick-drying thinners added to it will greatly impair its color. Hence it is advised that it be thinned only with raw oil and turpentine, adding some quick-dry-

ing varnish for a drier. If you intend varnishing over this, then add a little crimson lake to the varnish. Use the pure crimson lake only. White lead, as well as driers containing lead salts, will darken both English and Chinese vermilion. Be sure to always mix enough vermilion for the job, in order to insure one shade, which might not occur when mixing two batches for the one job. Vermilion does very well over a Venetian red ground. Being a very heavy pigment, vermilion settles in the cup or pot, and hence must be stirred frequently.

As a general thing, if a red is wanted on outside work, it is better to use Indian red, Venetian red, light red, or madder lake. For mixing and thinning use two parts of boiled oil, two parts of gold size, five parts of turpentine, and one part of color.

Artificial vermilions vary greatly in color and in durability. They do not appear to act so well on a white lead ground, hence it is advised that zinc white be used for a ground. This, however, refers only to those that contain some quicksilver. Artificial vermilions may be mixed with other pigments, but are best used alone. For muslin sign work, in water color, it does not discolor as when used with oil or turpentine. Upon the whole, this form of red is rather for use in temporary work than for that demanding more or less permanency.

It is well to remember that in using artificial vermilion or vermilionettes, two coats will wear better than one coat.

Quicksilver vermilion is liable to tarnish, yet it is more durable than the artificial article, holding color better, darkening if anything, while the other sort tend to fade out in the light.

TRANSPARENT COLOR.—The pigments useful for painting on glass when transparency is desired are

as follows: Prussian blue, crimson lake, Indian yellow, burnt sienna, lampblack, and the aniline dyes, mixed with white shellac. The latter make very beautiful colors, but are not durable against the light. They may be employed for temporary work. The first pigments named, those other than the anilines, may be mixed with the following: Mix up Venice turpentine two ounces, and spirits of turpentine one ounce; rub these up together and apply with a brush.

PERMANENCY OF COLORS.—Chrome yellow will darken under exposure to the air, the sulphur of which acts upon the lead in the chrome and produces black sulphide of lead, just as is done in the same manner with white lead. Chrome yellow also has the fault of fading more or less under exposure. Prussian, cobalt, Antwerp, and indigo blue all fade badly, whether alone or in combination with other pigment. Green made from Prussian blue and yellow chrome will fade out. A less bright green, but one that will be more permanent, can be made from yellow ochre and lampblack. Carmine lake, vermilion, and red chrome are all to be avoided in exterior work. The siennas, umbers, ochres, Vandyke brown, and all the earth colors, are permanent. Venetian red, Indian red, light red, and madder lake are reliable colors.

By permanency is meant that the pigment is proof against strong sunlight, acids, fumes, gas, etc. That is, the color will, to a certain extent, be immune from these agencies, and will not change color within a reasonable time. Speaking more correctly, no pigment or color is absolutely proof against these things, but some are very much more so than others; some quickly deteriorate in color, while others retain their color with more or less tenacity. It is very important for the sign painter to understand

his colors, knowing just what each one will do under certain conditions of exposure or wear. The expert of course knows this, and hence escapes possible loss from the wrong employment of pigments in his work.

Pigments produced by the aid of heat will change under the influence of heat of a different temperature, and will assume a darker tone of color.

Pigments produced by the dyeing process, fixed by a mordant upon some base, rose pink, for instance, which is made by precipitating a fugitive lake color on a base of whiting, will bleach out and expose its base, which is white. So we can understand why some pigments darken, while others fade or bleach out more or less.

Silicate of soda or water glass may be mixed with the following pigments without injuring their color: Venetian red, ochre, cobalt blue, ultramarine blue, cobalt green, ivory black, zinc white, barytes, and whiting.

CHAPTER X.

Constructing and Preparing the Sign Board.



SELECTING THE LUMBER.—Expert opinion differs concerning the selection of lumber for sign board making, some arguing that the outer wood, or that nearest the bark, is better seasoned than that near the heart, and that owing to its peculiar formation of fibre is less liable to warp, split or shake. On the other hand, others make the same argument for the wood that is near the heart. Be this as it may, certain it is that the wood used in sign making must be well seasoned, and be of good clear grain. Clear white pine has always been chosen, but owing to its scarcity and very high price it is less available than formerly, and we find a very good substitute in yellow poplar, which will not warp and contains no sap. Many think it far superior to white pine for the purpose, and certainly it is no mean rival.

Air-seasoned lumber is best, for this reason: Kiln-dried lumber contains about twelve per cent. of moisture, the normal amount of moisture in green lumber being twenty per cent. Hence, when a sign is made of green or unseasoned lumber it will shrink, for some of the moisture will dry out; whereas, kiln-dried lumber in a sign will absorb the missing eight per cent. of moisture and swell that much. This is why furniture, which is made from kiln-dried lumber, always swells, making it difficult to shut or open its drawers, etc. In other terms, lumber containing an excess of moisture shrinks, while that partially dried out will take up moisture and swell.

WIDTH OF BOARDS.—For a large sign board it is better to use narrow widths, for the reason that if there is any drying out or shrinkage the same will be evenly distributed over many cracks, as compared with large boards, which will show shrinkage in fewer cracks, with a corresponding increase in the width of the cracks. Wide boards are apt to warp, showing a hollow, and this will not be apparent in narrow boards. If a sign board must of necessity be formed of wide boards, then let each board differ with each other board as to the formation of its grain, or direction of wood growth, which will insure against warping to a great extent. Also, wide boards may be canvased, which see.

PUTTING THE SIGN BOARD TOGETHER.—It is best to use two or more boards where a sign is more than two feet wide, the narrow tongued and grooved boards being best for anything more than one foot wide. When well made such a sign will show as solid a face as one made from one board.

A sign that is to be lettered on both sides cannot be cleated, but rarely being of large size they can be made to stand without cracking if well joined together with tongued and grooved boards, with a stiff framing. If wider boards are used, not tongued and grooved, or where narrow boards are used, minus the tongue and groove, the edges may be strongly glued together. Or to make assurance doubly sure, the boards may be pinned together, by boring holes in the edges with brace and bit, and inserting wooden pins, which should be glued also. Coat the edges also with glue. This makes a very solid job.

Cleats of proper width and thickness should be firmly screwed on the back of the board, allowing as many screws to a cleat as may be necessary to make fast the underlying board, and too many screws

will do no harm, while too few are apt to prove ineffective. Countersink the screws. Nail on end cleats, which will hold the ends of the boards together. Then run a rim around the sign, one edge flush with the back of the sign, while the other edge extends over the front an inch and more, according to the size and character of the job. Under this rim put a moulding or quarter-round. These tend to strengthen the sign board, while adding to its appearance.

Seeing that it is to be subject to wind and weather, a sign board, to insure durability, must be made practically solid, with no open joints or parts where rain or damp may enter. It must be clamped very firmly together. All joints must be glued or leaded, and the surface be well smoothed with sand paper. A rough sign board may be canvased, as follows:

CANVASING A SIGN BOARD.—Make up a paint of white lead in oil, thinned with equal parts of boiled oil and turpentine, adding a small amount of hard-drying varnish of good quality. Apply a coat of this to the sign board, and while yet fresh on the board lay on it a sheet of light weight canvas or duck, which must be stretched tight, tacking it on the sides and ends. Then apply immediately a coat of glue size, which is to be allowed to dry. Then apply a coat of pure white lead mixed as for tin signs, that is, one that is not brittle and yet not too elastic; say one-fourth oil to three-fourths turpentine. Another method is as follows: Give the board two priming coats in the ordinary way, and when dry sandpaper smooth. Now make up a stiff paste of white lead in oil, japan gold size, and dry white lead; apply a good stiff coat of this paint, then lay on the canvas, which must be pressed down well with a roller or cloth, to remove any air bubbles or blis-

ters. When this has become dry it will be ready for painting on, using ordinary oil paint, though it is usually best to precede the paint with a coat of glue size, made quite thin, and when this is dry sandpaper it.

It is sometimes more economical to canvas a sign than to use the best lumber and workmanship, and the same with an old sign, being better to canvas than to scrape or burn off the old stuff.

PAINTING THE BACK.—It is important to paint the back of a sign board, applying at least one good coat of oil paint, for this will repel water and moisture, and so help in preserving the front. Any color will do, the principal thing being that the paint is of good quality. Any odds and ends from daily use will answer, straining it if necessary. All cracks should be puttied, so that the rain can not get in at any point. All irons supporting the sign or attached to it should be properly coated. Two coats of paint will be better than one, of course, but one at least should be applied, and this should be good and heavy.

GENERAL REMARKS.—Signs are made in various forms, and of metal as well as of wood, but the same general rule will apply in all cases of sign making, namely, that to secure a good result the sign board, whether metal or wood, must be well prepared or made. Formerly sign boards were exclusively a product of the shop, but in these days the carpenter or metal worker prepares them for the sign painter, in nearly every case. This is in accord with the modern tendency towards specializing all kinds of work. And it is just as well that it is so, as sign board making, as well as wooden letter making, properly is not a work for the sign painter. Nevertheless, I have considered it advisable to offer some practical suggestions for sign board making for the benefit

of those who do not find it convenient to use the ready-made article, the thousands who do not live in large cities or whose business renders it impracticable to use other than shop-made sign boards.

CHAPTER XI.

Priming and Painting the Sign Board.



THE painting of a sign board will be done according to its purpose and price. It is quite possible to paint a sign that will last forty or more years, but this will be done only by observing scrupulous care with every step of the work, from the priming of the board to the lettering and finish. There are hurry-orders that require a sign turned out in twenty-four hours, but obviously such work cannot last over a year. A sign painter says he has done gold and black signs in that time that have lasted well for four or five years; but if so, it was against the average life of such work. Where a customer asks for work in such quick time he does not expect it to last long. For ordinary work a sign may be given a week from start to finish, but for the very best class of work a month is none too long a time. This applies to both wood and metal signs.

The durability of a sign can be no greater than what its foundation warrants. Durability depends upon the best of preparation of board, surface, and finishing coats. Poor priming means a short life. Hence priming requires the best of white lead-in-oil paint, well prepared by mixing and straining, well rubbed in, and evenly applied, just as is done in first-class house painting.

PRIMING, SANDPAPERING, ETC.—White pine of selected quality will show no knots or other imperfections. Such quality, however, is rare, if not impos-

sible. Shellac all knots and sap, and if the board is very faulty in this respect, it will be better to shellac the entire surface, using the shellac very thin, and of the best quality of white or orange, according to color the finish is to be, dissolved in pure grain or denatured alcohol. Some use, instead of shellac, where the finish is to be black ground, coach varnish made black with japan drop or ivory black. Poplar having no sap needs only the lead priming on the bare wood. The priming paint consists of white lead in oil thinned with raw oil and a little turpentine, adding a very little driers. This is for a first-class job. Priming is better if it does not dry too quickly, as it will have more time to soak well into the pores of the wood. For this reason also boiled oil is not to be used in priming. Thin paint is better than that which is rather heavy. Some prefer priming with equal parts of raw oil, turpentine, and japan gold size, for thinning a very little white lead. Others again prefer varnish as a primer, using good coach varnish.

SANDPAPERING, SHELLACING AND PUTTYING.—The priming is to be well sandpapered when dry enough, and the surface made smooth. Dust off clean, then putty up all defects of crack or nail hole. Use white lead putty for this, and as the putty will not dry hard for a long time, it is usually best to shellac over it before second coating. Some prefer to shellac all large defects and glaze with putty on the bare wood, or on the shellac, rather. The putty should be made on the plan of the carriage painter's putty, with dry lead and oil lead, mixed with quick rub varnish and a little japan. If the finish is to be black or blue, it would be well to make the putty dark. The putty must be made to level up with the surface, otherwise it will show in the finished sign. When a sign board is given sufficient time in which to dry the putty will

become hard as cement, and in this condition it will sandpaper easily and well.

Where a large space has been puttied over it is well to lay a silver or aluminum leaf over it, to prevent the putty sweating out through the finish. Or shellac will do in place of the leaf, if more convenient.

SECOND AND THIRD COATS.—The second coat should be composed of white lead in oil, thinned with equal parts of raw oil and turpentine, adding a small amount of driers. The coat should be medium heavy, and be well brushed out and laid on evenly. The second coat dry, apply the third coat, for which use white lead in oil, and if a white ground, then add about one-third zinc white, which will make a whiter job. Thin with raw oil and enough turpentine to give a rather dead surface, or one not showing a gloss; perhaps an egg-shell gloss would be the name for it. If too glossy the lettering color will be apt to creep. Add just enough good japan drier to dry in reasonable time.

MAKING AN EXTRA GOOD SURFACE.—If an extra good hard, smooth surface is desired, then, after the second coat has dried hard, apply a coat of English or Reno's filler, three parts, and dry white lead one part. Mix to a paste with equal parts of rubbing varnish and gold size japan, thinning with turpentine to a working consistency. When this coat has dried hard, rub it down with a block of pumice stone or artificial stone, called Schumacher's, and water, to a level and smooth surface, same as that made by a carriage painter. After which apply two or three coats of flat color, each rubbed down smooth. The color of the coats may be as desired, the last coat forming the background for the sign and on which the lettering is done. It may be varnished if desired, or left dead flat, lettering with leaf or paint.

ENGLISH METHOD OF PAINTING SIGN BOARD.—Mix together equal parts of raw oil, japan gold size and turpentine, and with this thin up a little white lead, in oil. This is to be well rubbed in with a bristle brush. The second coat is made from equal parts of white lead in oil, best French ochre, and well dried whiting of the best quality. Each ingredient is ground by itself, in raw oil, until fine as possible, forming a stiff paste. Then the three pigments are mixed together until perfectly homogenous, gold size japan being added as a drier; then thin to a working consistency with turpentine. Apply two or three coats of this paint, and rub down each coat with sand-paper, rubbing the last coat preferably with pumice-stone and water. Then equal parts of French ochre, bath brick and white lead are ground with two parts of raw oil and one part of turpentine. Apply one, two, or three coats of this, as may be desired, rubbing down and washing off with each coat. This makes a surface like a plate of polished glass, for smoothness. It is then ready for whatever paint it may be desired for finishing with. Its surface will answer for marbling on, or graining, as well as a lettering foundation. The finishing coat must be allowed to stand until perfectly hard-dry. If a bright surface is desired, then coat it with the best copal exterior varnish.

BLISTERING AND SCALING OF PAINT.—The causes of paint scaling are, a damp wood or surface; hurried applications of coats or insufficient time for drying between coats; paint containing old or fat oil; oily coats, one on top of the other, with excess of driers; coats of oil color too heavy; varnish over oil coats. Pitch pine is very apt to blister on account of its rosin. An unpainted back may cause paint in front to go. Unseasoned lumber causes most cases of

paint blistering on signs. Paint unevenly applied or not well rubbed out will sometimes cause peeling off or blistering.

GENERAL REMARKS.—Use a round or oval paint brush for applying paint to a sign board; never use a flat or wall brush. Paint cannot be as well rubbed out with a flat as with a round or oval brush. Use a brush of best quality of hog bristles. Rub out paint well and evenly over the entire surface.

The last coat of paint for the ordinary black-and-white sign should be an egg-shell gloss, not dead flat nor glossy.

To wear well the paint coats should be smooth and hard all the way up from the start.

Stout paint is best, but unless you handle it expertly it will give a rough or uneven surface.

After the priming coat use rather little oil, depending on turpentine as the thinning agent.

Use the best of white lead. Use pure linseed oil and turpentine; turpentine from wood will give as good a result as that made from the gum.

CHAPTER XII.

Church Lettering.



LETTERING on church work is a part of the interior decorating, both as to form and color, and the closer the two harmonize the better will the artistic effect be. It would seem that the lettering, involving usually a lot of scroll work also, should fall to the decorator himself, as he could blend the two more perfectly than the sign painter as a rule is able to do. The form of the letter, known as medieval or church text, is highly ornamental, lending itself admirably to the purpose, and when the initials are illuminated or colored, as they always should be, the effect is very fine. There are various forms of church text, but all adhere more or less closely to a standard, and in the arrangement of the initials or capitals there is considerable room for artistic treatment. The inscription should be composed of capitals as much as possible, or as may be consistent with good taste. The illuminated capital may be surrounded with an artistic shield, which may be laid in gold or a suitable color, one agreeing with the general color design. Vermilion and other bright and clean colors may be used in connection with gold, or without it; pure deep reds, buffs, etc., are useful.

The lettering must be legible, the size of the letter being governed by the distance from the beholder. Legibility first, the decorative appearance being secondary. Yet each must be right.

The frieze offers an excellent place for the placing of a decorative text, but above the chancel arch is the best position of any, being in full view of the people. But there are many prominent places where lettering may be placed, though this matter may well be left to the decorator, as it is in practice.

Scrolls are generally used in connection with the lettering, and afford a very handsome effect; but they are by no means indispensable. They are not needed on a frieze or band, but where there is ample space that would be better filled up, the scroll becomes very useful, owing to its graceful lines and opportunity for the arrangement and display of color. Avoid straight lines in scrolling, however, and on the contra, avoid the too lavish use of curves. Straight lines in connection with scrolling makes the best effect, using the straight part for the main or larger portion of the inscription. Lettering never looks as well on a curving line as on a straight line. Another advantage of the scroll comes when we have a very long text and not sufficient room for stretching it out, in which case we can make a series of curves and so get it all in. But this demands care in the handling, getting the words in readable order, and avoiding the use of hyphens as much as possible; and when a hyphen must be used, as may occur at the apex of the arch, let it divide the word correctly. An example of bad work may be seen in the following inscription:

GLORY TO GOD IN THE HI-
-GHEST, ON EARTH PEACE.

If the text cannot be made to fit the space perfectly, it would be better to select another that will. Never divide a word in the middle of a scroll, even though there is an angle there. The hyphen must

be placed between two syllables, not in the middle of one.

It is not always possible to make the scroll perfectly symmetrical, or well balanced, as, for instance, a short piece at the top, a longer piece in the middle, a short piece at the bottom—and so on. Symmetry is not essential to good effect, and as previously stated, legible and correct reading must take precedence of design. Make a scroll for each text or inscription, not forcing one style of scroll to take in any or every sort of inscription.

I have spoken of the letters or alphabet to be used in connection with ecclesiastical lettering, and would add to it that the style of letter must accord with the architecture; use old English or Gothic lettering for a Gothic building. Again, letter according to the nationality of the worshippers; thus, for the English speaking use old English or church text, or Gothic; for the German use German text. Some of the Gothic styles of letters are almost unintelligible to the ordinary person, and when very much elaborated or ornamented it is impossible to say what the artist intended to make, unless we can take our cue from the balance of the inscription. This is particularly true of the capitals, while some of the lower-case letters are little better. Take the m, and it looks like a w; or the n and u will look alike. It is better to employ the best examples of church text letter, of which there are several very desirable ones.

While some writers advise the use of illuminated capitals, others urge against the practice, saying that in contrast, say with black or dark lettering, the capital is hard to distinguish, and in some lights may be almost invisible. There is some reason in this objection, yet I believe that when properly colored the illuminated capital will be found satisfactory in every

respect. Of course the light must be considered, and colors well chosen. Red when dark enough makes a very good color for the capital, and especially in connection with gold and light blue or orange. In fact, a good colorist will make a satisfactory job with illuminated capitals, where a poor colorist will fail in any case.

Indian red is more satisfactory a color than vermillion red, while brown lettering with green or blue capitals, blue or purple lettering with green capitals, will make good combinations, as the colors can be kept equal in tone very easily.

In laying out an inscription on a scroll it is first necessary to ascertain the number of letters the text has, and then to divide up the text with convenient intervals to allow of its best fitting the space. Having arranged the position of each word, draw around them the scroll, allowing the folds to serve as rests in the reading of the text, or to admit of its curving to the shape of the arch, or whatever space it may be intended to fill.

The practical decorator never lays out his scroll first, then twisting it to fit his inscription, for it would be a hopeless task. The scroll must be adapted to fit the part of the inscription or the whole inscription, as the case may be, that is to go on it, and in determining the shape of the folds it is a good plan to leave a small space between the overlapping and the underlapping lines.

Where quite a number of words are to be employed, as in a panel giving the Decalogue, we should avoid the use of those highly complex and enigma-like letters which some decorators affect, and which few can read. The reading should be quite smooth and easy to understand, just as we would wish a sign to be.

An expert writing on the subject says: "The functions of lettering are two-fold: in its main it ought to give enrichment to the material on which it may be placed, and, secondly, it ought to serve as a reminder, without unduly asserting itself, of, maybe, some particular, perhaps Biblical quotation, the correctly proportioned setting out of which would give equal enhancement to the structure as its interpretation would afford ennoblement to the senses. Here, again, the lettering would need to carry with it character and beauty of form. Beauty, contrary to general opinion, does not by any means necessarily imply elaboration in the form of the letter, or added ornamentation."

Symbols are largely used in church decoration, and a symbol is in effect a monogram. For "Jesu Hominum Salvator" and "I Have Suffered," there is "I. H. S.", and while both renderings are of course incorrect, yet the symbol is right; in medieval times the name, Jesus, was rendered in its Latin form, as IHESUS, which by abbreviation became I. H. S. The Greek equivalent for Christ was Christos, and as there were no Latin letters to represent all the Greek characters, the Roman rendering is usually XPICTOC, from which we obtain the abbreviation, XPC. The early Christians used XP or XPC exclusively, though frequently they incorporated Alpha and Omega, or A and O, with the XP or XPC. Then, from what has just been stated, we are to take I. H. S. as representing the name of the Lord Jesus Christ. But here, says an authority, we are faced with a curious fact. The S in the first monogram and the C in the second express the same original letter. The Greek Sigma, pronounced S, and in small type written very much like our s, is in the capital letters of the Greek alphabet exactly like our C.

It is obviously an anachronism to use two languages or two types in the same scheme of symbolism, so that by common consent and practice we use in classic decoration the classic lettering and the classic form I H C and X P C, and in Gothic and later work the later or black letter Latin forms.

In Renaissance decoration we revert to the classic lettering, but use the medieval form as I H S and X P S.

These general rules are frequently broken, either through ignorance or carelessness, or by the exercise of that artist's choice which has little respect for authority.

CHAPTER XIII.

Painting Wall Signs.

REPARING THE SURFACE.—The amount of preparation of a brick wall for lettering on will depend upon the character of the job, its price governing the quality of the work. The condition of the wall also figures in the matter. For a strictly first-class job, and given a wall in fair to good condition, a few coats of good oil paint, well put on and brushed in, will give a fine surface for good lettering. Each coat must be given ample time for drying in. For cheaper work a sweeping down of the wall and some cheap rough paint will do. For good work, or ordinary good work, an unpainted wall, if not in the best shape for painting, should be swept down and be given a size of weak muriatic acid, and maybe it will be necessary to do some scraping away of loose stuff before this. After the acid wash has dried perfectly a coat of clear boiled oil may be applied, giving all the work will take. Upon this, when dry, may be applied any desired color of good lead paint. All breaks or imperfections may be filled with a putty made as follows: Mix to a paste with boiling oil seven pounds of good, clean, sharp sand, washing it to make sure it is clean; two pounds of slaked lime, and two pounds of dry litharge. If this is used on the bare wall, as it may be, if necessary, then let the holes be first coated with all the oil they will take, which may then be left to dry. Then putty up. This cement does very well in this way, and afterwards the entire

wall may be given a coat of oil, raw or boiled. When dry, give it a coat of pure white lead mixed with equal parts of raw and boiled oil, with a little turpentine and driers. If the ground is to be dark, then add some black to the coat of paint.

CHEAP WALL PAINTS.—For a large sign on a rough dead wall, rock or cliff, stir a solution of green vitriol (copperas or copper sulphate) into some lime milk, which will give a greenish paste. Lime milk is simply freshly slaked lump lime with the surplus water poured off, after standing until the water has come to the top. This will give a yellow color, after its application to the wall. If a deeper color is wanted, then add more copperas. The paint adheres quite well to the wall, etc., not readily washing off, and has a brighter appearance than a paint made from yellow ochre and lime. It affords a specially good background for large letters in black or purple.

Another cheap paint may be made as follows: Take 150 pounds of bolted whiting and mix to a paste with water; then add 6 gallons of hot soft soap; now break up 60 pounds of white lead in three gallons of boiled oil, mix to a paste, and add three gallons more of the oil; then stir in lead and whiting together. In order to make the mass as smooth as possible it should be run through a hand mill.

If a red ground is wanted, on a cheap job, dissolve four ounces of common glue and add same to four gallons of water. Then dissolve one ounce of pulverized alum in hot water, add to the glue size, then stir in enough dry Venetian red and yellow ochre to make the brick color. Two coats of this paint will usually be sufficient to form a good lettering ground.

The ground for much commercial lettering is made from dry lampblack mixed with boiled oil to a working consistency. If the wall is new, or the weather

cold, add a little benzine or gasoline, which will cause the paint to flow and spread more readily.

THE LAY-OUT.—As wall signs are usually at some distance above the normal range of vision, and away from it also, the letters need to be made “fat,” or thick, special alphabets being prepared for this purpose.

When the sign is of considerable dimensions, it is best to draw a sketch of it on paper, using a scale say of one inch to the foot. This is the usual way. The length of a wall sign may usually be estimated on the ground, and where the bricks will admit of it, being conspicuous enough, they may be counted, estimating four bricks as thirteen inches. The length of a swing being known, this assists in counting horizontal distance, or sections of the work, the drawing showing distance also.

BREAKING ON LETTERS.—By “breaking on” the wall sign painter means the painting in of the letters in the rough. This is followed by cutting in the letters with the ground color, which, usually, is black.

Color is important in this work, and sharp contrast is always to be sought after. With a black background and white letter a sign will be visible at a great distance, and if the letters are of the right size and proportions, with not too many words for the space, it will be easy to read the sign. Legibility here counts for more than mere good lettering even.

The white letters may be broken in with pure white lead thinned with benzine. The benzine causes the paint to set quickly, so that the painter can at once cut in his work without fear of the white mixing up with the black. Also, in the case of large work, when it is not desirable to move the heavy staging often, benzine thinning enables the painter to finish his work completely on each stretch.

Where the work is near enough to the ground to be done from a ladder, oil color may be used, finishing the job next day. In this case use no benzine, but oil and turpentine and driers only.

Benzine will not, of course, give a durable paint; but then most all commercial or wall signs are done on yearly contracts, and great durability is not expected or desired. But the work will usually last one or two years, and then a change is usually desired. Where a business sign is painted on a wall, on the business house, as may often be seen, say on the sides, a more permanent work should be done, making a good foundation with pure white lead and raw oil, and lettering with the best oil color.

THE STYLE OF LETTER.—The wall sign painter has at his command a number of alphabets specially designed for his use, a style known as “fat” or chunky. A style of letter that would be admirable when viewed close by would, of course, be useless at a distance; it would lose its finer lines and leave little else to be seen. Big stout letters and plenty of room or open space, with sharp color contrast, are required for this kind of sign. Stout letters and of such form as these are makes it easy for the wall sign painter to letter a vast space in a day.

THE BRUSHES USED.—Flat bristle wall brushes of not less than four inches width should be used in breaking on with, and for filling in the background. Cutting-in and making the borders, outlines, etc., may be done with sash tools of from one to three inches width. Usually the brush used in the lettering color, which is always light, can finally be used in the background color after it has become too short and stubby for making letters with.

CHAPTER XIV.

Painting Bulletin Signs.



THE legend inscribed in black on a cemetery fence, many years ago, and reading something like this: "USE PINK PILLS AND KEEP OUT OF HERE," was the humble beginning of bulletin board advertising. It has become an immense business, it being estimated by one in a position to know that there is maintained in this country, at this time, about ten millions lineal feet of bulletin boards, the cost of which is, approximately, \$15,000,000, the capital invested in the various plants, which are scattered all over the country, being upwards of \$100,000,000.

BUILDING A BULLITIN BOARD.—Bulletin boards may be built in divers ways, each way a good way, too. The main point is, substantiality. Use good lumber and plant the posts deep in the ground, say about four feet; it is not too deep, considering the stress the structure suffers from heavy winds. Brace the structure well, too. Use No. 2 shiplap boards, planed on one side only. Paint or lead the laps before placing.

Sheet steel being much used, in place of boarding, we will give the best experiences of experts with this material.

Get V-crimped painted roofing, in ten-foot lengths. Lay a sheet of this on a cement pavement, if convenient, and tramp over it, flattening out the crimp. Then lay a piece of wood, two-by-four will do, on to the sheet and pound with a heavy hammer, to flatten the sheet more perfectly. This will give you a sheet

26 inches wide by 10 feet long. Build the bulletin in two sections, with two or three sheets to a section, seams running up and down. Allow an inch of each sheet to extend out at one side to lap over the next section. For a ten-by-ten foot sign use a three-sheet and a two-sheet section. For a metal sign the painted sheets are better than galvanized metal. You can do the painting in the shop, and when dry take them out to the job. Nail on the top sheet first, and lap the next sheet over this, so that the upper edge of the second sheet will catch rain and carry it back of the sign, not allowing it to go down over the front and staining same more or less.

The sheets are to be run horizontally. For fastening the irons on the frames use $\frac{3}{4}$ -inch corrugated fasteners. Use either No. 4 or No. 5. The corrugated fasteners are very useful in this kind of work.

PAINTING THE BULLETIN BOARD.—Whether metal or wood, the bulletin board must be well painted; it will not pay you to do otherwise. Both sheet steel and boards should be well painted on both sides, to give due protection against the weather. Shellac all knots and sap in wood. Paint with pure lead in oil, and apply enough, in well spread coats, to form a good surface.

New iron must be made clear of rust and dirt by scraping and brushing off. Then give it a coat of red lead mixed with raw linseed oil. On this may be applied as many coats of paint as may be desired or thought needful, the base of the paint being red or white lead. Let the first or priming coat dry hard, as it will when red lead is the base of the paint. New iron should be cleaned and primed as soon as possible after leaving the place where made. See that it is perfectly dry before painting, and paint in dry weather if it is possible.

Old painted iron should be cleaned of old paint, and be well brushed with benzine or turpentine, after which it may be painted as directed for new iron, though it will not usually require as many coats.

Zinc should be primed with a hard paint, made from white or red lead, thinned with turpentine, adding a little varnish to bind it, also a little japan driers, unless the base is red lead, which is a drier itself. New rolled sheet zinc should be treated with a weak solution of hydrochloric acid or nitric acid, a tablespoonful to the gallon of water. It is also well to abrade the surface with No. 2 sandpaper before priming it.

Galvanized iron may be treated the same as zinc, with acid. But the best preparatory wash is made from a solution of two ounces each of copper chloride, copper nitrate, and sal ammoniac, in one gallon of water, in a porcelain or earthen vessel. Then add two ounces of muriatic acid. It is then ready to use. Apply with a broad bristle brush, and when dry it may be painted over. When first applied this wash is black, but soon changes to a grey. Diluted muriatic acid also is good, forming on the surface muriate of zinc, which will take and hold paint well.

If galvanized iron has been exposed to the weather for several months it may take paint all right without the acid bath, but it is not sure. Paint to adhere well must not contain an excess of oil, but be made rather sharp with turpentine. Some painters advise a priming coat of red lead and good metallic brown, half-and-half, but red lead alone is good enough, though the metallic will lower the cost of the paint. Venetian red, as well as metallic brown, might be used to prime with, if cost is a matter to be considered. At any rate, whichever paint be used, one coat is thought to be better than two on galvanized

iron, particularly where red lead is used. But where a certain color finish is desired two coats at least must be applied.

LETTERING THE BULLETIN.—Bulletin signs are done very much the same as wall signs, as far as style of letter and mechanical work goes. But white letters cut-in with black, or any color in fact, will be given a day to dry in, not being cut in immediately, as in wall work. The lettering and filling in colors are those ground in oil or japan, as may be called for, and the thinning is done with turpentine. The letters are fat or stout, as in wall signs. The ground may be almost any color, but white letters on a black or blue ground make about the most readable sign. A sign is greatly helped by having a suitable border around it, and this border should be made in the proportion best suited to the particular size of the sign; say a two-inch stripe for a 10-by-20 foot board. Double lines, the inner one half the width of the outer one, look well. Make the border the same color as the letters. If two colors are used in the border, make the inner one the lighter color, if the background is dark; reverse this order if the background is light. Never put two colors of the same depth of tone side by side. If there are curving lines, leaving some space, fill in with scroll work. For ordinary plain work use a simple scroll; for more ornate lettering use a more elaborate scroll.

For cheap work use a correspondingly cheap paint. Compound lead, which is simply a mixture containing some white lead but more something else in the way of white pigment, may be used for making a cheap grounding, thinning with benzine. A cheap wash, suitable for some kinds of work, may be made by putting two handfuls of bluestone (iron sulphate) in two gallons of water until dissolved. Place the

bluestone in a coarse bag, and suspend the bag in the vessel containing the water. Soft water is best. Mix dry color with this and apply as a paint. It is said that this paint will stand exposure well for several weeks. Of course, it is only for the very lowest grade work.

PRICES ON BULLETIN SIGN WORK.—There is no fixed standard of rates for doing bulletin work, some painters simply making a bid on the work that is based only upon what they believe they can do it for and have a profit, estimating the job by the square foot. Much depends upon circumstances also. In a general way we might say that that one-coat work and filling on brick or wood buildings of fair size ought to be worth five cents per square foot; though much is being contracted for at a much less figure. Usually, however, contracts are made on the rental basis. One painter says that from \$15 to \$30 a year for a section 9-by-12 feet would be a fair price, with an allowance of one-third off for renewals, where the original painting is to continue for another year. When a bulletin board is divided up into small sections the total yield will be much more than where the entire board is sold to one party. Of course the painting of the small sections takes more time according to amount of space than what would be required to do the whole board in one or few sections. Pictorial work not duplicated must be charged for at higher rates than plain work. Certain parts of the board will be worth more than certain other parts; the top is more desirable a position than the bottom, from the advertiser's standpoint. Be sure to know exactly what work you are to do, and where it is to go, before concluding a contract.

In a letter to the author, written in answer to an inquiry some time ago, Mr. G. G. O'Brien, perhaps

the largest operator in advertising sign work in his city of Pittsburgh, Pa., says: "In every city that I can think of at this moment the price of a bulletin sign includes the rental in all cases. The prices vary from 25 cents a running foot to 40 cents a month for all ordinary locations, on a yearly contract, painted twice. Special locations will advance the price beyond 40 cents, and on less than yearly contracts the price is proportionately higher. For this price the work is assumed to be strictly first-class in every respect. It must be noted here also that prices vary as to cities. The work may be and is as well done in one city as in another, but rentals may differ. For instance, at Cleveland, Buffalo, and at some other points, where territory is broad, rentals are lower, and hence bulletin prices are quite low. We charge more here in Pittsburgh than you do in Philadelphia, because territory here is quite limited, while it is not so in your city. Bulletin painting, like most other work, is a local proposition. Put up as good boards as you can get built, then paint them as good as you know how; price will likely be determined by the quality of your work. The location of the sign will of course have to be good. We have one sign in this city where the advertiser pays us \$175 a month, but this is an expensive location. As a rule, advertisers will pay liberally for the work where the work and location both are good."

SIGNS READY MADE.—Bulletin signs may be had ready made. They are shipped in sections ready for the posts. One manufacturer advertises the following rates for these three sizes:

Size	6 to 11 Signs	12 or More
4 x 6 ft.	\$3.00 each	\$2.75 each
4 x 8 ft.	4.50 "	4.25 "
8 x 20 ft.	16.00 "	15.00 "

It is advised that one not familiar with this kind of work send for catalogues issued by those who make such sign boards ready for use, if a large number are to be used. At least, such catalogues contain much information that must be of value to any one interested in the work.

CHAPTER XV.

Various Commercial Signs.



AND-PAINTED POSTERS.—Build two frames large enough to carry paper four feet wide, and make the frames 30 feet long; join them at the bottom, separating them one foot; joint also at top, separating the frame 18 inches. Cover the frame with screen wire, stretched tight. Now hang a “sample” poster on the screen, half on one side, half on the other side. Place electric lights inside the screen, which will light up the paper, making it easy to duplicate it indefinitely. This is done by covering the pattern poster with paper, upon which copy the original pattern. Hold the paper in position by means of wooden paper clips. Do the lettering with printer’s ink, thinned with gasoline or benzine; or use japan color instead of ink.

As a comparison of cost, an eight-sheet poster is $6\frac{1}{2}$ by 9 feet; the poster itself, in large quantities, will cost the advertiser 30 to 40 cents each and will have to be replaced monthly; the charge of the billposter for displaying it in prominent places will be 72 to 96 cents, or more, sandwiched in together, and look shabby and ragged part of the time at least, while the hand-painted poster sign will stand alone and be clean and readable at all times.

ROADSIDE SIGNS.—Many roadside signs may be seen that are as much as 6 by 10 feet, with very bold and large lettering. Such signs run into money fast, and as they are furnished to merchants, or run in their interest, the advertiser expects a large trade from the

party and a pledge that he will see to it that it is put in a good position and be maintained properly. He must agree to do this for at least two years. A 6 by 10 foot sign, including the lettering, will cost approximately \$7.50 in large quantities, the price being shaded a little when taken in larger quantities. A similar sign 4 by 6 feet will cost about \$2.00; while a 2 by 4 feet sign may be had for a dollar, or less.

HALF-INCH BOARD SIGNS.—These signs have been a familiar object to the public for many years, being thin boards 30 to 36 inches long, by 4, 5, or 6 inches wide. They are a little more expensive than paraffined signs, but are more rigid, and are useful for nailing on trees, posts, etc., along the roads, as well as on fence rails, or anywhere that a card may be placed. Such signs cost the buyer from eight to ten cents each, in quantities, with the tacking up extra.

PARAFFINED CARD SIGNS.—These signs are tacked up around the country in large quantities, and cost about three cents each, with two cents additional for the tacking. This cost is usually shared by the buyer and the merchant handling the goods.

THE PROJECTING SIGN.—The projecting or flange sign is attached to door facings, being painted on both sides. It costs from 25 cents to 75 cents, and is gum-painted or lithographed. The cost will be according to the quantity ordered at one time, and the amount of printing on them.

The wooden sign maker puts out what he calls a double-faced shank board, and also a larger size that is practically a metal sign. The wind batters down a large projecting sign, or bends it out of shape; whereas a wooden sign twice the size will stand up well. A wooden projecting sign 1 by 3 feet costs from 50 to 60 cents, in small lots; this is for a double-faced sign.

DRUM SIGNS are useful in places where any other sign could scarcely be used at all, and they take up very little room on the side of a doorway. They are also readily seen and easily read by persons coming and going. Drum signs are made on glass and brass, and are lithographed or gum-printed on tin or steel. For a tin or steel drum sign with stained black pine frame and two-color letter the cost will be from 40 cents up.

A ten-foot sign cannot of course be placed just anywhere, and hence smaller signs are made to fit. A steel sheet sign on a wooden frame, 1 by 4 feet, useful under a window or over the door, may be bought for about 50 cents each.

CHAPTER XVI.

Painting Signs on Tin.



JAPANNED TIN SIGNS.—Japanned tin comes ready for use, and in colors as desired; but black is the most in use. The sheets come in various sizes, adapted for ordinary signs, and where any other size may be needed the tin may be cut with shears, being careful not to chip the enamel. The cost of japanned tin is comparatively high, but the prices charged for such signs amply repay the outlay. It makes one of the neatest special signs that the sign shop can put out, being particularly adapted for use as an office sign, or professional sign, for physicians, etc. The lettering is done either in gold or gold colored paint, and in either case the work must be accomplished with much skill and neatness. The lettering is done after this manner: First make the lay-out on manila paper, cutting the paper an inch larger than the tin, so that it may be turned down and under the tin, to secure it. The inscription is drawn on the paper with a lead pencil, as accurately as it is to appear on the sign. This is done with the paper folded over on the back of the sign, so that the size of the tin may be used as a guide in the lettering.

When the inscription has been finished, the paper is taken up and dry ochre or whiting is rubbed on the side opposite to the inscription, and then this coated side is laid down on the japanned side of the tin, carefully, and the edges of the paper are folded down over the tin, to hold it fast. Now trace the

inscription with a hard-pointed pencil, carefully, which operation will transfer the design to the japanned tin. Lift the paper now, and gently blow off the surplus whitening or ochre. Now the tin may be sized and gilded, or be painted, according to the lettering desired.

If the tin is to be gilded, then it will have to be prepared with a coating which will prevent the leaf from adhering where not desired, and for this purpose the white of an egg, with a little water in it, beaten well together, will do as a size. Then trace in your design. Then size the letters with fat oil size, and when of the right tack lay the leaf. The oil size must not be too heavy, or it will show a raised effect in the gilding; make it thin, and pencil in the letters carefully, for as the oil size is so will the letters be. When the gilding is done, rub off surplus leaf with raw cotton and set aside until next day; then the sign may be cleaned up for delivery. Gold may be imitated with paint of the proper color.

The oil size used for gilding on japanned tin should have a little white lead in it, and be used quite thin. Gild day after sizing the job, for best results. Never use a size that is quicker than four hours, if you are after the very best job in this line.

FROSTING TIN FOR SIGN.—Make the tin free from dirt or grease, dirty spots and stains. Make up a solution of two parts of sulphuric acid to one part of rain water, preferably, though any soft water may be used. Now make the tin plate quite warm, though not so warm that the hand cannot be held on it comfortably, and while in this condition coat it over rapidly with some of the solution, using a sponge, tied to a stick. The liquid quickly evaporates from the tin, and then it may be rinsed in clear cold water. If it is to remain in the natural tin color

it may be varnished over with some good clear copal varnish. Or if it is desired that the tin have color, use any clear transparent colored varnish. When dry it is ready for lettering.

GOLD VARNISH FOR SIGN.—Leave two pounds of finely powdered chrystals of copper acetate for a long time in a warm place. Rub the powder, as soon as it has changed to a pale brown, with turpentine, and mix it with six pounds of copal varnish at 70 deg., C. Solutions will be complete in about fifteen minutes, and after standing a few days the varnish will be ready for use. Dry in artificial heat after applying the varnish, for the exact color depends on the drying temperature. If the best copal varnish is used the gold effect will be very permanent, and will adhere to the tin tenaciously.

GLAZED TIN SIGN.—Varnish a sheet of bright tin with damar varnish, to which has been added a little good hard-drying floor varnish, just enough to harden but not discolor the damar. The brighter the tin the better the effect, which will be an imitation of silver. Cut in the letters, and fill in the background with any desired color. This makes a cheap and durable advertising sign.

WHITE LETTERS ON TIN.—Make the sheet of tin clean with sal-soda water, then dry it well. Then paint the tin with a good pure white lead paint, thinning white lead in oil with turpentine, adding a little good hard-oil. Give the tin two coats of this paint, brushing it out well, and making a smooth surface. Sandpaper each coat lightly with fine paper. Cut in the letters with any desired color, and fill in with the same. The cutting-in color should be japan color, thinned with turpentine, and adding a little varnish to bind it, and to prevent the color from cracking if

exposed to the weather. When sufficiently dry the sign may be varnished.

Always paint the back of the tin, to prevent rusting.

Another effect may be had by making the background some light color, then outlining the letters in black, and shading them. The outlining and shading causes the letters to appear as if standing out from the tin. A scroll or two may also be added, before varnish is applied.

For painting on tin a color mixed about the way the coach painter mixes his for second coat of lead will be right. In other words, add to the thinning about one-fourth raw oil. This will give the color sufficient life or elasticity to insure durability. A quick drying color will not do, as it will be too brittle, nor will it answer to use an oil paint, which will dry on top while the under portion will remain soft. There are no pores in tin for the paint to enter or hold by. In time the under part will dry, but that will mean trouble for the lettering color. Gold leaf is sure to crack over an oil paint foundation. The best thing to advise, under the circumstances, is a paint thinned with both oil and turpentine, say one-fourth oil to three-fourths turpentine, for the first coat, which will give a paint neither soft nor brittle. For the second coat reduce the quantity of oil enough to give an egg shell gloss to the paint. Then you will have a safe ground to letter on, on tin.

CHAPTER XVII.

Lettering on Muslin, Oil Cloth and Canvas.



LETTERING ON READY SIZED MUSLIN.—Muslin comes repared for the sign painter's use, and most sign painters use this kind, as being more economical and convenient than the shop prepared goods. The colors used for lettering on this muslin are ground in japan and thinned with benzine, to prevent spreading. Add a little varnish to bind the color.

LETTERING ON UNSIZED MUSLIN.—Unsized muslin may be lettered on if made wet and lettered while in this condition; the dampness prevents the paint from spreading, and this is an old-time way of doing the work. A good color for painting on damp muslin may be prepared in this way: Take three parts of damar varnish and two parts of benzine, shake well together, and add to any desired dry color, forming a paste, which may be worked on the slab until smooth, after which it may be thinned with the same liquid and is then ready for the lettering.

MIXING THE LETTERING COLOR.—The instant your brush, with its color, touches the muslin you will know whether the color is right or not, whether too thick or too thin. That is, if you are expert. Different pigments require different thinning mediums; some require gold size, some turpentine, others benzine, or varnish, in certain quantity. Varnish is used where a slower drying medium is required than gold size affords. Too much turpentine will cause a halo around the letters about as bad as oil. Use just

enough to make the color work freely, and use benzine in preference whenever possible.

COLORS FOR MUSLIN SIGNS.—Bright colors make the most striking signs on muslin, though probably the majority of muslin signs are done with black alone. Bright blue and bright red are favorite colors. Cheap ultramarine blue will do well enough, but the red had better be of good quality. The imitation vermilion are very fugitive. Cheap reds will run all over a sign in the first rain. English vermilion is costly, but is more permanent. You can mix with it twice its bulk of whiting, first grinding the whiting in turpentine on a slab. Use the best grade of whiting only. First mix the red with gold size, then add and mix the whiting with it. This will not materially affect the red color, while greatly reducing the cost of the paint.

The colors appearing best are black, Prussian or ultramarine blue, and English vermilion. Where the initial letter is done in red, using a fugitive color, the result may be something like this, taken from an English journal:

HIS REEHOLD UILDING AND
O E ET N ASY ERMS
PON ONG UILDING EASES
PPLY STATE FFICES.

THE LETTERS AND SHADING.—Gothic, or block, letters look best on muslin signs, and they are easy to make. If the letters are to be shaded, give each one ample space, so that there will be no crowding. Shading is seldom required.

MUSLIN SIGN DRY IN ONE HOUR.—Use no oil in the lettering color, if quick drying is desired. Use dry colors of the best quality. Grind the color in japan or furniture varnish to a paste; thin with gasoline

until it will work freely under the brush and not spread over the muslin. If made too thin it will run, making unsightly work. Such a sign will last thirty days exposed to the weather. By adding a little boiled oil to the color the job will be more durable, and may last three months. But for a temporary job omit the oil.

A very good paint may be made from vegetable black one part to two parts of gold size, three parts of turpentine, and less than one part of boiled oil. Another liquid, suitable for certain other pigments, may be made from boiled oil two parts, gold size two parts, turpentine five parts, and color one part.

COMBINING COLORS TO ADVANTAGE.—Dark blues, greens, reds and browns give strong effects in muslin lettering, and canary yellow, lemon yellow, and very light shades of blue, green, and gray make the best shading. For the high lights use white, chrome yellow, and golden ochre, etc.

DESIGNING THE SIGN.—Do not run too many straight lines of lettering, but break up the monotony by a curved line here and there, if possible. Bring out the principal words in large, bold letters, on straight and curved lines, with a scroll or two by way of embellishment, surrounding these with light shades of color.

THE BRUSHES USED.—For japan color use a sign painter's brush; for large letters use an artist's fitch brush. Large letters may be outlined with the smaller brush, filling in with a larger brush. Filling in is very good practice for the learner, by the way. Very large letters may be done with a bristle brush.

SPEED IN LETTERING.—Speed comes with practice, though some are naturally quicker than others. The finer the color has been ground, with correct thinning, the better it will flow from the brush and

spread. Japan color thinned with benzine to the right consistency flows and spreads well. In muslin sign work it is necessary to become quick in order to make it pay and get out orders in a hurry, for very often that is the order.

WATER COLOR WORK.—The surface must be well sized for water color lettering, and it is best to apply two good coats of glue size. Or one coat of starch paste will do.

Here is a liquid that may be used for water color work on muslin or canvas, for outside use, that will work freely and stand exposure to the weather quite satisfactorily: In a clean vessel boil a quart of clean water; add four ounces of shredded beeswax to it, and let boil until dissolved. In another vessel have a pint of boiling water, and add to it an ounce of white soap; let it become dissolved, then add it to the beeswax mixture. Put it on the fire and allow it to boil for a few minutes. Now prepare a mixture of two ounces of white glue or gelatine in a pint of hot water, and add to the wax solution. Mix. It is now ready for the water color, which may be that ground in water without size. Its waterproof qualities may be increased by the addition of ten drops of bichromate of potash to the pint of mixture. In case you wish a white paint, use only white wax and white soap.

TRANSPARENCY PAINTING.—The muslin used for this kind of work must be of fine texture and of the best quality. Stretch it on a frame, size it with white gelatine size, and after the size is dry re-stretch on frame and give it another coat of the size. Perhaps it is a better way to place the muslin in the size and wring it out, then place it on the frame; this is the method followed by many. Try the size on a bit of muslin first, to see if it is right, and also try the colors

on it. The colors used in landscape painting may be used for this work.

The design having been prepared, it may then be traced, pounced, or copied on to the muslin, but be sure that the outlines from which the copying is done are bold and strong. Stencils may be made from the usual stencil paper, in the ordinary way, and powdered charcoal is best for the pounce.

The rules which apply to oil painting answer also for this kind of work, only that all broad lines may be rubbed in with a small sponge, instead of a brush, where a very light tint is desired, as the color can thus be rubbed out finer than a brush will do it. This applies only to the broad flat tints, particularly to those very delicate.

A very fine effect may be obtained by the use of one transparency behind the other. On the front surface is painted all that is required to be seen in the clearest relief; the painting on the other transparency is modified in its effect by the painting in front.

Use the transparent pigments for this work, and they must be of the best grade, or such as artists use. Thin with turpentine and a little copal varnish as binder.

To stand exposure to the weather, coat with a wax size, made by melting some white bees wax on the stove and thinning it with turpentine; make it very thin, say one ounce of wax to a quart of turpentine. Apply this wax size while it is still quite warm, using a bristle brush.

For white work in general a size may be made as follows: Slake a small lump of fresh stone lime in hot water, and then add skim milk until quite thin; strain through cheese cloth. This makes it quite water-proof. Color as desired.

SOAPSTONE IN THE MUSLIN SIZE.—The use of steatite in the size for muslin, as well as for canvas, duck or cheese-cloth, has been urged by a correspondent, who says: I make a stiff paste from good flour, then thin it so that it will work well under the brush, using a stiff wall brush ranging in size from two to six inches, according to the work in hand, and then I add soapstone (steatite) in quantity sufficient for the quality of goods that is to be sized. Cheese cloth requires the most and heavy duck the least. For ordinary unbleached muslin add at the rate of a table-spoonful of soapstone to the pint of paste. A very smooth surface may be had by applying this paste with a paddle made from a cigar box lid, rounding off its edges, so that it will not make edges lines on the surface. Thin down quite sharp, and give it a coat of shellac.

Paste for this purpose may be made stiffer than for brush use. Make the paste free from all lumps before adding the soapstone.

LETTERING ON CANVAS.—Before painting on canvas it must be stretched on a frame or smooth wall, stretching it tight, until the material is even and perfectly smooth. A rough wooden or brick wall will not do, as the rough parts will render smooth lettering impossible.

SIZING AND PAINTING.—Size with good strong glue size, and give it two good coats, the first drying before adding the second coat. The size must be applied hot. When the size is dry rub off the nibs with sandpaper. If the canvas is to be painted all over, make the paint with the best white lead, thinned with two-thirds raw oil, and one-sixth each of turpentine and japan driers. Let this coat stand at least two days, then apply a coat of white lead thinned with three-eighths of raw oil, one-fourth of japan, and

three-eighths of turpentine. Let this coat stand two days. Then apply a coat of white color-and-varnish. When this has become dry, rub smooth with pumice stone and water. Then it is ready for the lettering. This is for a strictly first-class job.

A cheaper job may be done as follows: Sponge the canvas with water, and when almost dry apply a coat of lead and oil paint, making it as near what the last coat is to be as you can. For the second coat use less oil. Mix the lettering color with enough oil to make it elastic.

PREPARING MUSLIN FOR ROLLING UP AFTER PAINTING.—The following formula is given by the late English chemist, Standage: Dissolve one ounce of soft soap in thirty fluid ounces of water by boiling; then stir in one quart of boiled oil, and when cool stir in five ounces of gold size.

Here is another way: Dissolve white wax in turpentine by the cold process, which will require about three days. The mass must have the consistency of soft soap. Now add three-fourths of a pound of this to two pounds of zinc white, ground in oil, and two tablespoonfuls of soft soap. This thick mass, to which is added a trifle of japan, is applied to the material so that all pores are full while all surplus stuff is removed by a spatula. When the coating is dry thin the mass to a brushing consistency with equal parts of boiled oil and turpentine. Give it one full coat. But if this does not cover the canvas completely, apply a second coat. The further manipulation is carried on as in other sign work where oil colors are used.

HALO AROUND LETTERS.—The effect of using oil colors on canvas is the same as on muslin, leaving greasy edges around the letters, and making the work very unsightly. Prevention is indicated by the

use of benzine for thinning with. If the halo is there, however, then proceed to remove same as follows: Outline the letters with a medium gelatin size, extending a trifle beyond the stains. When the size is dry, go over it with the same color that was used on the letters, keeping a trifle back from the outer edges of the size. This will cover up the grease marks, and the color will not spread.

WATER COLOR WORK.—For a medium which can be used with water colors, will work freely, and will stand a fair amount of exposure to the weather, the following is recommended: To a quart of water heated to the boiling point in a clean vessel, add a quarter of a pound of shredded beeswax, and boil until the wax is liquified. In the meantime have ready a second vessel, and in it dissolve one ounce of white soap to a pint of water, dissolve thoroughly, and add to the beeswax and water. Allow this to boil for a few minutes longer. The result will be a milky emulsion. Next make up a glue size by dissolving two ounces of white glue or gelatine in a pint of water and add to the emulsion. The medium is then ready for the addition of the water color, which should previously be ground in water without size to a free flowing consistency. The mixture can be rendered still more waterproof if immediately before using ten drops of bichromate of potash are added to every pint of the medium. In making up a white for use it will be necessary to use white beeswax and white soap in preparing the medium.

LETTERING ON OIL CLOTH.—Color is apt to creep on oil cloth, owing to the smooth, glossy surface it has, and to prevent this wipe the cloth with a sponge made damp with vinegar, and sometimes even plain water will do the trick. Whiting and water are used by some, and benzine may be considered a sure cure,

besides drying immediately. Benzine is useful also on all painted and varnished surfaces where paint or varnish crawls.

There is a painted cloth on which lettering color will not creep. This painted cloth is preferred now to the ordinary oil cloth.

To letter on enamelled drill or oil cloth, mix your color with equal parts of raw oil and japan gold size, thinning with turpentine.

Carriage trimmers' pebbled cloth, which may be had in several different colors, offers good material for making a swell sign. One particularly good effect may be obtained by coating the surface with japan black, thinned with turpentine to make a dead black finish; letter on this with either gold or silver bronze, adding shades and scrolls in clear varnish.

CHAPTER XVIII.

Silk and Satin Banner Painting.



HERE are two manners of working which are generally used in painting upon fabrics; one consists in binding the color with gum, the other in using oil for the same purpose. In the first way, Arabic gum is melted in warm water and then added to the pigments in a sufficient quantity to bind them. Size is too coarse a material, and glue is too dark in color for fine work. For this process flake white is used to give body to the painting, for it has to be solid painting for a fabric when used as a banner or panel. Again, the texture of the fabric must not grin through the painting. In the second manner, oil is used in the place of the gum, and white lead forms the body, no turps or varnish being used—they both tend to make the painting brittle. The work painted with oil-color has a shining effect; the gum-color is without. Even with all the shining effect of oil-color, in both these methods the work shows less brilliant and bright in color than the fabric itself. The painting, too, is of a different texture than the material itself.

METHOD FOR LARGE SILK BANNERS.—The first thing to be done is to make or procure a stout wooden frame about 2 inches or $2\frac{1}{2}$ inches in stoutness. The corners must be framed up in the same way as those are for stretching canvas, with wedges; in this case without a cross-bar. The whole field of the silk needs to be come-at-able. Along each edge of the silk it is necessary to sew a narrow band of material. About $1\frac{1}{2}$

inches or 2 inches is wide enough. This is to drive the tacks into, when attaching the silk to the frame. It must be of a material much stronger than the fabric which is to be stretched, in order to hold it. When fastening the material to the frame, the general habit is to lay it upon the floor to do so, having first laid a clean drop cloth down, so that no dirt can possibly stain the delicate fabric. The stretching is begun in the center of the four sides of the frame, and finally finished at the corners. The fabric is drawn up as tight as possible, with the tacks about half an inch apart. The frame may then be raised upright, and either reared against the wall or supported by poles, long enough to reach the ceiling. These must be pulled tight, so as to grip both ends of the banner. This is necessary to be done, even when the banners are placed against the wall, in order to steady them. These props also enable the banner to be tilted over a little at the top, to protect the fabric from any chance drops. The silk may now be further tightened by gently tapping the wedges at the corners.

THE POUNCING.—The design for the whole banner having been closely pricked, it may be pounced with powdered whiting, to which has been added a little pumice-stone dust, in order to cause the pouncing to be easily brushed away; or French chalk may be used. Care should be taken not to get the pouncing to be too strong, as the after-sizing is liable to fix it, and so interfere with the painted work. The pouncing is generally done in separate parts, as a pounce the size of the whole banner is too big to manage. The center has only the outline pricked, as generally the picture in the center contains a great variety of objects, and is so pictorially painted that pouncing is impossible. So it needs must be sketched in with charcoal, and partly drawn with the brush.

THE PAINTING.—In painting a banner in oil-colors, no turps is used. It takes the shine out of the painted work. Turps also causes the part to which the paint is applied to become brittle. Absolutely nothing but oil should be used. The utmost caution needs to be taken, as oil on unprotected silk spreads, such as a drop from the brushes, which looks like a dark blot, and cannot by any known means be removed without showing where it has been. When such a misfortune happens, as it sometimes does, during the progress of painting a banner, it must be dealt with. If possible, the ornament on the flag should be stretched so as to cover the blot by bringing it into the scheme of the design, as a piece of added ornament. If this is not possible, after sizing all round it (everywhere there is any ornament must be first sized), a fly or butterfly must be painted. As an illustration of how oil spreads on silk, it has been known for a portion of oil to get over the protective sizing and then to creep right across the whole banner, completely spoiling it (an expensive matter where silk is concerned). It shows a dark line, which destroyed the whole effect. Nothing could be done to remedy it. To protect the silk from the oil, the outline of all painted work must be well sized before the paint is applied, the outline to be only about $\frac{1}{4}$ inch beyond where the paint is to go. The reason of sizing the outline only where practicable, is because sizing causes stiffness in the silk. For this, parchment size is applied hot and strong. It is best to use it from a clean gluepot. The first coat may be a little dilute, so as to work easily, but the second must be as strong as it can be worked.

The larger space in the center, to contain the principal pictures, after being well sized along the outer edge, is always given a coat of oil white lead (no turps). It should be used in a thin condition, and be well rubbed

out. White lead is used, not zinc white, as, although it is a purer white, it is too brittle in its nature for banners which have to be rolled up, and thus are liable to crack. Tutil used to give the centers of the banners, previous to the application of the paint, a coat of rubber solution, in an attempt to get greater elasticity and to cause the paint to bear out with a better gloss.

THE ORNAMENT.—The decoraion on a banner is generally seen only when on the move, so it should be large in contour and bold and simple in the painting. As the light whilst it is being carried strikes through the silk and not through the painting, the ornament needs to be the same shape on both sides of the banner, each side exactly fitting the other side. It may, however, be differently treated in detail and cutting up. As it is also necessary that the ornament should be as brilliant as possible, it is generally first silvered. To save labor, the filling-up and the gold sizing is done in one coat. A goldsize is used composed of pure fat oil and white lead, nothing else, so it is bodily laid in on both sides of the frames, and silvered when ready, which is in about twelve hours. It is immediately clear-sized with weak parchment size. When this is dry it is ready to be cut up with dilute Vandyke brown. This again allowed to dry, the shading is done with graduated washes of raw umber. Again left to dry, the reflected lights are washed in with raw umber. Of course, other colors may be used, according to the taste and skill of the operator, or to agree and harmonize with the whole color of the banner, which is generally a strong red or blue. The whole forms a very capable process in skilled hands. The writing is mostly done by drop black in plain letter.

STENCIL. POUNCE AND SIZE FOR SILK BANNER.—The practice adopted for painting upon silk is to first

draw the design full size upon paper. This drawing may then be used to pounce or for tracing the design on the silk. If the former, prick a series of dots completely round all outlines, and with white powder (preferably French Chalk) tied up in muslin, pounce the powder through the holes of the design. To trace the design rub the back of the paper with chalk or Indian red (according to whether the ground is light or dark) place against the silk and go over all outlines with a lead pencil or other blunt point. Before commencing painting fill in all parts to be covered with paint (1) thin clear size, (2) distemper made with size and Chinese white with a little glycerine added to prevent cracking, or (3) a coat of flattening color made of white lead, varnish and turps. This preparatory coating should be taken to the extreme edge of the design. It is intended to prevent the oil colors spreading. Size minimises the destructive action of oil paint upon fabrics. Coarser materials should also be treated with size preparation as described above.

SIZE FOR BANNER WORK.—A gelatine size may be made as follows: Add two ounces of pure gelatine to one pint of hot water, strain, and apply while hot. Some size the material all over, but this perhaps is not the best way. When the size is dry apply a coat of white paint to the sized parts, leaving about 1-16 of an inch of the sized parts unpainted. When the white paint is dry it will be ready for the lettering, picture, or gilding. Some prefer coach japan, thinned with turpentine, for a size. Egg size, preferred by others, and adapted for certain kinds of work and material, may be made by adding to the white of an egg its own bulk of water, mixed well together. On this you may apply either oil size or gild on the wet egg size. Of course it must be dry before applying oil size. If oil size is

used it must be kept back from the unsized material a little ways.

To use Russian isinglass size, first stretch the material over the frame, then apply alum water all over it, and when dry apply a size of Russian isinglass dissolved in boiling water, using a piece the size of a silver fifty-cent piece to the quart of water. When this is dry draw or stencil your design on the material, then paint in with either water or oil colors. If you sketch in the design use French charcoal crayon.

ANOTHER METHOD FOR BANNER WORK.—Stretch your material on the frame, then pounce in the pattern, then cut in the letters or what not with shellac varnish, or with japan, which will not spread on the material. Make the edge perfectly true. For gilding, apply oil size over the shellac or japan ground, being careful not to allow the size to go beyond the sized parts, which would stain the silk or satin. Apply the leaf in the usual manner, and smooth it out with raw cotton, using the medicated or jeweler's cotton. If the lettering or design is to be shaded, do the shading first, in the proper place. If to be high-lighted, apply same to parts opposite to shading.

HANDY CHALK LINE FOR BANNER WORK.—A handy chalk line for banner work may be made by fastening a medium-sized fish hook to the end of a chalk line, filing off the barb. The hook may be readily inserted and removed, and renders it quite easy for one man to do the chalking and snapping of the line.

CHAPTER XIX.

Painting the Barber's Pole.



THE sign painter is called upon occasionally to re-paint a barber pole, or even to paint a new one, which may be more difficult than re-painting an old one. to a novice. In the old pole we may find sufficient guide in the lines of the former painting to make the job quite easy.

It is necessary to have the edges of the stripes neatly cut in, whatever the nature or number of the colors. This cannot be accomplished if one wet wedge is run against the other. The painting of the stripes must be done according to the shape of the pole; if square, like a porch post, for instance, then the best way is to provide a thin board of the width the stripes are to be, and holding it on to a face of the pole, at an angle of 45 degrees, mark along its edges with a lead pencil, and see that the corners meet each other on the adjoining side. Take the line across the champers horizontally. Say the pole was painted solid white, then cut in with red, or with both red and blue, if the two colors are desired. In this way you have no wet edges to paint against.

For a round pole, paint it white, then when dry and hard prepare strips of manilla paper of proper weight, making them the width you want the stripes to be, and wrap them regularly around the pole, beginning at the top and fastening them with tacks at the bottom. If red and blue are to be run, have two papers around the pole, which will leave white in between each color. Care must be taken to equalize the space so that the

colors will alternate evenly. It is seldom that more than red and white are run on the pole.

The purpose of the paper wrapped tightly around the pole is to keep the paint from getting on to the white, and to make good, clean-cut edges. Also, it facilitates the work.

Some run a pencil along the edges of the paper, and then remove the paper, painting in the stripes with a sash tool. When the paper is left on you may run the stripes with a painter's pound or No. 8 brush.

Barber's poles are now made in a factory, in many styles, and all ready to set up. These range in thickness from 6 to 12 inches, measured at the base. The cost varies according to style and finish, prices beginning at about \$8.00, and running up to \$27.50. There are also made the index hand, of wood and nicely painted, at 75 cents. Then there are made for the barber shop signs done with enameled ware, small signs used for indicating the bath, as well as for use inside and outside the shop, over doors, and so on.

Some of these signs or poles are works of art, indeed, being of artistic form and painted and gilded in the best possible manner. Red, white and blue are the colors used, though these are not the only ones, as in addition to gold there are other colors, and often the base will be marbled. Some will show white stars on a blue ground, usually being at the top of the pole and under the ball, which is gilded. Poles of irregular form are painted quite ornately, in various designs, which usually are simple and chaste. In all, the factory-made barber shop pole is a work of art worthy of adorning and indicating the place of business of so important a man and workman as our barber; tonsorial artist is the modern term, by the way.

The barber pole has a history that is far from being

uninteresting. Many years ago it was thought that all ills afflicting human flesh might be relieved by the letting of the victim's blood. Plebotomy, it was called. General Washington, in his last illness, was relieved of some blood by the doctors, and many another patient less illustrious has undergone the singular process. In those days the barber became a blood-letter, and in fact he has never relinquished the job. The barber provided a pole that his victim was asked to grasp tightly, so as to steady his nerves, and when not in use the pole was placed outside the door, with the white and oft blood-stained muslin ligatures wrapped around it. The law required this. From this circumstance arose the use of the striped pole, with its red stripes, symbolizing blood, the white stripes indicating the muslin ligatures or bandages, and the blue serving to express the feelings of the victim. The pole was surmounted with a fixture that represented a basin, used for catching the blood in. Thus, essentially, is the barber pole of to-day. But there are not so many poles in evidence now, the tendency being to have less display of the kind around the outside of the shop, especially first-class shops.

CHAPTER XX.

Smalts and Smalting.



BEFORE cutting around the gold letters breathe on the glass at the edges, and the paint will not creep.

The permanency of smalts is a most important factor in the life of the sign, and good boiled oil is necessary to this.

If sifting will not clean the smalts, then let it fall from a height, say a step ladder, on to the sign; the sand will get there ahead of the dirt or dust, and make a clean job.

One cause of trouble comes from not having the cutting in and filling color ready when wanted; better have everything ready.

If you run out of cutting-in color, there is a delay while preparing new color, and in the interim the color on the sign may become partially dry, and this will cause greasiness, or streaks, to show.

Too much driers in the cutting-in color is bad, as it may, and often does, cause streaks or "shiners." Use boiled oil and no driers.

If you have a blue smalts job to do, do not use blue paint for the ground. Use lampblack mixed with boiled oil, and add enough white lead to make it a slate color or dark gray.

Never use raw oil on a smalts job, as it will creep on the edges of the letters, leaving ragged edges.

Thin the cutting-in color with a mixture of two-thirds boiled oil and one-third turpentine; make your color thin enough to flow well without running.

Cut in the letters as rapidly as you can do it accurately.

If you mix the ground color with raw oil it will dry too flat to take the sand properly. Boiled oil and plenty of lead in the black is the rule of safety.

Cut in the sign with a small brush or pencil, according to the size, and fill in with a larger brush, soft hair. Bristles will put the paint on too thin and not smooth.

Do not have the boy do the filling-in; it is a man's job. Care must be taken with this work in order to get a perfectly even and smooth surface for the sand; what the painted surface is, that will be the sanded surface; rough, or fine as velvet.

A made-while-you-wait sign may be made as follows: Shellac the unpainted board, and when dry, in a few minutes, pounce in the letters. Roughly quick-size the letters, gild, and cut in, then throw on the sand. Send out next day.

The temperature of shop is important in smalts work. If too hot then the paint will dry too quick. Get as far from the stove in winter as possible. In summer hunt the cool part of the shop.

There should be an abundance of light for smalting work.

If there is quite a lot of lettering to do, outline the same rapidly, and accurately of course. By the time the last touch of the brush goes on the first will have set pretty well.

If painted within two hours, let the job stand twenty minutes or so longer, then sift on the sand. Let the sand on a few seconds only before dumping.

Use neither japan, driers or turpentine, but boiled oil only.

Never sift sand on fresh color; that is why we advise letting the job stand twenty to thirty minutes. When

set a little it will take the sand better than when the paint is fresh.

Begin sifting on the sand at one end, sifting regularly and with care, to get it on evenly.

The rule is to apply sand until the gilding is almost entirely or even quite concealed by the sand.

If the sand is quite fine it may be dumped off almost immediately after being sifted on. But if coarse, which it never should be, but is sometimes, especially after having been re-used many times, the sand may be left on for an hour at least.

Where very fine sand has been sifted on it is well to give it another sifting on, to catch possible places where it did not catch the first time. This is not often required.

Be sure to clean off any chalk that may be on the board from the lay-out. It is better to follow the chalk line with a lead pencil, and then brush off the chalk clean.

A charcoal crayon is better than chalk for laying out the lettering, as the oil paint when coming against charcoal will not cause a ragged edge to the lettering as chalk will. But charcoal must not be used on any ground that is not flat painted.

Here is a formula recommended by an expert: Mix dry lampblack with boiled oil on a marble or glass slab, with a spatula, until the mass is free from lumps, or until perfectly butter-fine. Then add enough white lead, dry, until the mass is of a lead or dark gray color; this will do for any dark smalts. The lead gives body. Thin to the proper consistency for use with equal parts of boiled oil and japan for a small job, but omit the japan for a large job, for it will cause the paint to dry too fast.

For light colored smalts use white lead paint as a base. Tint to any desired color.

Paint used for cutting-in with should be rather stout, being thinned with boiled oil.

Some recommend boiled oil and a quick-drying varnish in equal parts as a thinner, but we see no advantage over boiled oil.

One painter advises leaving the smalt on for two hours before shaking it off, saying that there will then be no trouble from ragged edges and smalt sticking where not wanted. The idea probably being that if not dumped off while wet the paint on the loose sand cannot get on to the letters and stick there.

If you have a very large sign to gild and sand, do not try to slow up your color with raw oil, but cut-in one-half of the sign and then sand within a foot of the end of the painted part, being careful to not get any sand on the last part, for that would cause sand to get into your pencil. Then cut in the balance of the sign, and sand it. Let the sand remain long enough to set, and dump the entire lot off. Then collect the sand and sift it over the job again; lift one side, then the other, to disturb the sand, then finally throw it off and place the sign on the easel. If you have used the very best smalts you will find the surface as fine as velvet.

When black paint is used without any white lead in it it will run in streaks and leave ragged edges on the tops of the edges of the letters, which may come down on to the gold, no matter how careful you may have cut in the letters.

CHAPTER XXI.

Practical Sign Painting Notes.



OR quick work use japan color as it comes from the can, thin with turpentine, but use no oil in it.

A palette is not always necessary, but for most work on the easel time is saved by its use.

Make clean sweeps with the pencil, as close to the line as possible, and so make every stroke count.

Dark japan driers are not the best with lettering colors; use the very light colored japans, and as little as will do the work.

A pane of double-thick window glass makes a very good slab for working color on. The slab may be laid in a bed of putty spread over a board a little larger than the glass; let it dry there.

Styles in letters constantly change, but the old stand-bys, the plain Romans or Gothics, please the business public very well.

A good plan for the beginner who essays a glass sign is to apply whiting wash to the outside of the glass, and when dry mark out the letters with a pointed stick. After the lettering is done on the inside, wash off the whiting.

The old way was to tie a piece of chamois skin to the tip of the rest or mahl-stick, but a piece of cork or rubber is as good.

To make glass take the chalk, the glass must be made perfectly clean with whiting and water, first, then with

ammonia water, then wash off with clear water and chamois, wipe dry, and polish with tissue paper.

When you have a small sign to get out in a hurry, in cold weather, heat the sign before painting it, and heat it well, only avoiding blistering the paint, and after lettering it heat again, for a few minutes, then place it in a cold place to dry.

Too much japan will retard the drying of paint, and it is best always to use as little as possible, even of the best, and the best should always be used, no matter what it may cost.

Never do a brick wall sign in cold or wet weather, if it can be avoided. Dampness will cause the paint to perish.

Some sign painters use a short handle to the lettering pencil, but you will notice that their work is not true, but wobbly. A long handle steadies the hand better.

For shaping letters, designs, etc., use one-third yellow chrome, in japan, one-third rubbing varnish, and one-third spar varnish, the best grade of each.

Sometimes a store closes out and wants a sign made on the windows to advertise the fact. Coat the glass with whiting wash, bound with a little glue, then letter on this as you would do on muslin, using japan color thinned with benzine.

When you letter or decorate a store window have a boy on the outside, on a step-ladder, holding up a piece of looking glass. It will enable you to see what you are doing, and how it looks.

Outlining, shading, or backing, with a painted background, should be done in the order named. Mix varnish with the colors, using turpentine to thin the background only. Tube colors are the best.

For wiping or trying out lettering pencils, use empty gold leaf books. Attach the book to a table, and as you

use a leaf tear it off. Or coat manilla paper with shellac, the back of sandpaper answering also. The shel-laced paper is particularly useful for carrying in the kit, being so much lighter than glass.

There is nothing equal to gilded letters on a store window, well burnished, the lettering done in the best style of the art, and no other sign for the purpose will give as general satisfaction to the business man.

The Roman letter is daddy of all others, and the beginner is advised to begin with this alphabet and master it before taking up any other letters. When he can make the Roman perfectly he is very near being a good sign painter.

Nearly all sign painters when doing an acid-embossed sign on glass use asphaltum varnish, to which is added a little good copal varnish. It is allowed to stand at least two days before applying the acid.

A letter laid with gold leaf will look at its best when outlined with a fine black line, owing to the contrast made.

Perhaps nothing is better than black lettering on white ground. It shows up even better than white lettering on black ground. This may not be strictly true from a scientific standpoint, but practically this is the effect. Red catches the eye better than any other color, the scientists say, red against green giving the strongest contrast, yet for practical purposes the black on the white ground shows up the best.

Too many colors tend to diminish the advertising value of a sign, and hence the matter of color is a very important one to the sign painter. Some sign painters use as many colors as possible, while others, equally good, favor as few as possible. It would seem that the latter view is the better one to take. Use only as many colors as may give artistic value to the work.

Good sign work demands finely ground colors, those ground "butter fine," as the color makers call it, being the best. It is well for some purposes to grind the dry color yourself on the marble or glass slab, using a medium stiff palette knife.

For convenience and economy use the tube colors, where a large quantity of color is not required, as in lettering an ordinary sign, but remember that it is oil color and needs some driers, of which be careful in the using; too much will dim the gloss of the paint.

Bronze powder is difficult to use for lettering or ornamenting, and only the very finest should be employed. If you will add a little flake white to it the working will be easier.

The yellows work easily under the pencil, but the whites are rather short and brittle. Flake white is the easiest of the whites to pencil with.

Japan colors, in cans, should be covered with turpentine, not with water nor oil; keep a close lid on. Japan color seems to form a skin, or dry under oil the same as when no covering is on it.

When you want to add some oil to a japan color, add first a little turpentine, mixing this thoroughly with the color, and forming a paste with it; stir this well, then add gradually, stirring it, and the color will not curdle.

CHAPTER XXII.

Notes on Gilding With Gold Leaf on Wood.



USE THE XXX brand of leaf for gilding on wood.

A book of gold leaf is sufficient to gild one and one-half square feet of average surface.

Gilding on oil size can be burnished at once.

Gilding work should stand over night, at least, before varnishing it.

Varnish impairs the natural lustre of gold, and does not adhere well on gold or any other metal. If you must varnish over gilding, then first apply a very thin coat of best wearing body varnish, and after a day or two give it a coat of the best elastic finishing varnish.

Pale gold leaf does not stand outside exposure as well as the darker shades; being an alloy of gold and silver it tarnishes from gas, etc. For exterior use the medium shade of color is best.

Keep the gold leaf in a dry, warm place; dampness will tarnish it, and cold hurts it, too.

The size for gold leaf should be something like gold in color, hence it is customary to tinge the size with a little ochre or yellow chrome.

The true color of gold leaf is blue or green, as may be proved by holding a leaf up to the light.

Leaf should be applied squarely on the surface of the letters, in order to prevent crinkling of the leaf or breaks.

To lay loose leaf, fold the upper paper over the leaf at the desired width and run the forefinger nail lightly across the leaf, along the creased edge.

Gold leaf may be tested by placing a drop of nitric acid on a piece of clean glass, and laying a piece of the leaf partly on the acid and partly on the dry glass. The acid will not affect pure gold, and the amount of decomposition of the tested leaf will indicate the amount of alloy.

The gold leaf should be 22 carats fine, if of the best grade.

One leafing is enough for gilding on wood. Double gilding impairs the lustre of the gold.

When the leaf adheres where not desired remove it with a damp chamois.

In cold or damp weather it is well to dry the leaf before using it, to guard against possible dampness or cold.

If you have to touch up a bad spot in the gilding, do not leave a ragged edge, but cut the letter straight across; better still, re-leaf the entire letter.

If the oil size is too wet it will drown the gold, kill its lustre; better have the size too dry than too wet.

Size and gild a little beyond the letters, so that the cutting-in paint will hold well on the leaf.

If in doubt about the paint on the board being sufficient to take the size and leaf properly, better apply shellac to the letters, using it very thin.

If you breathe on the gilding before cutting in with paint it will take the paint better, not creeping.

To obliterate the mark left by the lap-joins of the leaf stipple it with the ends of the bristles of a new sash tool. If the gilding shows dull or tarnished before leaving the shop may be it has been affected by coal gas, or the quality may not have been the best; gilding usu-

ally dulls if left long in the shop. Restore its color by a weak solution of muriatic acid.

It is a common practice to try the oil size by the back of the forefinger, and hence the hands should be clean.

If the size has become too dry to take the leaf well try breathing on it a few times; usually this will soften the size so that it will take the leaf all right.

Rough and too heavy a size will cause rough and uneven gilding; the remedy lies in prevention, by laying the oil size as evenly and smoothly as possible.

Gilding that must be varnished had better be given a coat of pale thin shellac first, for a quick job. If gilding is varnished the day it is laid there is danger of its scratching, hence the thin shellac will prevent this and do no harm at the same time. Varnish over the shellac.

When rubbing off size or color, even a very small spot, take it all off at once and remove the spot completely.

To prevent laps showing, a very likely thing on very smooth surfaces, have the size quite tacky.

After gilding a small sign allow at least two hours to elapse before cutting it in with paint.

The blooming of the gilding may be caused by impure air or standing too long in the shop; remove it with a damp chamois, rubbing very lightly.

GILDING CARVED WOOD LETTERS.—Dip the wooden letters in a thin priming color of pure white lead and oil, and hang up to dry. When dry, sandpaper smooth, or use curled hair, which will be easier to get into the curves with; steel wool is also good. Then apply a coat of flat white lead paint, with a trifle of varnish in it. When dry rub off and apply another coat of the paint. Before putting on the oil size give it a coat of thin shellac, to make sure all suction is stopped. Use slow oil size. Now lay the leaf, and when dry enough tack to

the sign board, which has been prepared by painting with flat color. Finish the board according to order, whether plain paint or smalts.

TO PREVENT LEAF ADHERING WHERE NOT DESIRED.—The old way was to size the surface with white of egg mixed with water, white of an egg being added to about one-half pint of water, or less, according to strength desired. If the surface is not extra tacky, dusting it over with powdered whiting or soapstone will do, but if too tacky for this, size over with white of egg is safest. To prepare white of egg add it to a gill of water, and beat it to a froth by means of a clean sash tool, twirling it between the hands. Then apply it with the same brush to the parts to be protected.

A pounce bag may be used for dusting on any powder with. Steatite or soapstone is very useful as a pounce, and whiting also is useful, dusting it on and rubbing off the superfluous portion. Some prefer making a wash of the whiting and when it is dry brush it off, which leaves enough to form a resist. This is particularly good when using oil size or varnish, as these show clearly through the whiting ground. After laying the leaf the whiting may easily be removed with a damp rag. A thin wash of common starch also answers the purpose, applied with a soft brush or sponge. A thin solution of stick licorice is also used by some, who keep a supply of it in a bottle ready for instant use. It is liable to decompose, however, if kept very long. The addition of a little alcohol will preserve it. A very good resist may be had with a raw potato, cut in two and using the cut side to rub over the surface of the work. This will leave a thin film of starch as a resist. Perhaps this is the best for most purposes. Or the juice from a grated white potato may be used, applied with a soft brush and allowed to dry. Fullers earth also has

been used as a resist. Zinc white and water with just a trifle of gum Arabic in it is used and preferred by some.

REMOVING LEAF.—When some gold leaf has become attached to a part of the job where not desired it may often be removed with plain water, and failing in this try a little soap with the water, or a little soap on a damp cloth. Be sure to remove every vestige of the leaf. If the leaf adheres very stubbornly try a little nitric acid in water, or strong vinegar, on a piece of flannel. A soft sponge wrung out of hot water sometimes proves sufficient. Or a five per cent. solution of muriatic acid will do the trick. Be careful in using the strong acids that the lettering is not affected, the acid being liable to raise the leaf. This latter solution is the one employed for removing films from photographic plates.

RECOVERING GOLD WASTE.—An authority declares that in his shop of six men he saves at least \$500 a year in gold waste or "sweepings," which are sold once a year. This seems an extravagant claim, yet there is no doubt about there being enough sweepings to pay for the time and bother of saving it. At any rate, it is done in all sign shops. What is called a "skew box" is made from a cigar box, removing the lid, and making a light frame to fit in the top; on this frame fit some fine wire screen. As soon as leaf is laid on the oil size it may be rubbed or burnished, to remove surplus leaf, which is done with a wad of raw cotton, holding the skew box in the left hand and rubbing the loose leaf into the box. The rubbing is done in an upward and circular manner, the cotton catching the leaf and thence it may be conveyed to the wire screen, against which it is brushed and the leaf is reduced to fine particles, which fall into the box. The cotton wads also are saved

and sold. For large wooden letters that are gilded provide a large box, large enough to allow you to do the letters on the box, so that all waste will fall on to the screen and can be rubbed into the skew box. Some of the leaf is used for patching the letters with, and where patent leaf is used there is very much less skewings than when loose leaf is used. Some remove the surplus first with a camel's hair brush, then rub off with the cotton.

Book binders save the waste leaf by means of a ball of pure rubber, which is sold by houses dealing in supplies for book binders. It is said that one of these balls will take up as much as \$25 worth of waste leaf before becoming unfit for further use. This ball may be made from three ounces of pure Para rubber, costing about 75 cents, or may be a dollar now, per ounce, which cut into shreds with a sharp knife, dipped now and then in water. Place the shreds in a vessel and pour over them enough turpentine to cover the mass; then cover the vessel tightly, to prevent evaporation. After 24 hours remove the rubber, and knead it in the hands until it ceases to stick there, a very tedious work.

The waste, brushes, cotton, or whatever may have been saved from the gilding, are burned to ashes, then the ashes are leached with boiling water, containing some hydrochloric acid. The gold residuum is then boiled with aqua regia, which consists of nitric acid 1 part and hydrochloric acid 3 parts. This dissolves the gold, forming chloride of gold. After filtration and evaporation to dryness the product is dissolved in water, and precipitated with sulphate of peroxide of iron. The precipitated gold powder is purified with hydrochloric acid.

CHAPTER XXIII.

Making and Using Fat Oil Size.



WHEN old oil gold size is ready for gilding, it may be described as dry but not hard. It has been described by some writers as "nearly dry," "partly dry," and "surface dry," when the proper stage is reached for applying the gold, but all these are incorrect descriptions, for it is well known that once the air is prevented from contact with linseed oil, as is the case of enclosing the latter with a metal envelope, all further drying of that oil ceases, and were the gold size not dry when the gold is applied, it never would dry hard; and together with the gold would easily rub off on being cleaned at any further time, a consequence which most gilders have at one time or another actually experienced. Linseed oil has three stages clearly marked in its drying process, all well known to regular users and distinguished as setting, drying and hardening stages. Between the two last named it is said to be "on the tack." The value of gold size lies in the lengthening suspension of the last of these three stages, during which it carries a "tack" upon its surface while quite dried throughout its texture. When thus ready, if the gilder holds the back of his finger against the size with a gentle sideways pressure he does not in the least disturb its surface or substance, though he finds an adhesiveness holding his finger, with a tenacity called the "tack" and which firmly holds the gold or other metal leaf laid upon it. The hardening process goes on independ-

ently of any further atmospheric contact when the drying stage has fairly passed. Upon this latter feature the value of this mordant rests.

FAT OIL SIZE FORMULA.—Boil some pure raw linseed oil and place it in a wide-mouthed bottle, hang in a sunny window, where no dirt can get into it. It will require some weeks to become fit for use, but it will be the best possible.

To get an over-night oil size, add to clear fat oil size one-tenth its bulk of turpentine driers of the best kind.

For a forty-eight-hour oil size add one-twentieth of its bulk of best turpentine japan driers.

Thin the above sizes with gasoline, to make it flow easily.

To fat oil, one part, add two parts of gold size japan, with chrome yellow enough to give it the desired gold color.

A slow-drying oil size may be made from two parts fat oil and one part finishing varnish, adding also a few drops of japan gold size. Add ochre or yellow as desired.

A quicker size than the preceding one may be made by using a medium quick drying varnish and just a little fat oil, and rather more japan than called for in the other formula.

Mix equal parts of freshly boiled oil and coach japan, and color with chrome yellow, then add an equal amount of the whole of fat oil. This makes a slow size, one that will do to gild on the next day, or a day or so after that. Of course drying depends largely upon the atmosphere or the heat of the shop, but you can hasten or retard the drying by varying the proportions given; the more fat oil the slower the size. A size may be made as quick or as slow as you please.

Expose some pure raw linseed oil in an open-mouth-

ed bottle where it can have sun and air, and in a few weeks, or months, it will become oxidized or thickened, in which condition it is fat oil. Its action in drying may be quickened by the addition of turpentine japan drier.

Fat oil is also produced by chemical means, and may be bought ready for use. It is thought by some to be better than the shop-made article, and can be thinned with turpentine alone, the tack holding longer than usual, so that it may be leafed on the next day or next week.

A good oil size may be made from fat oil to which add a little pure boiled oil and lemon chrome to color. This size dries almost perfectly in 24 hours, holding its tack for 48 hours at least, and still give a good tack.

If the job is to stand over night, use two-thirds fat oil, one-third finishing varnish, and a few drops of gold size japan. Add ochre or lemon chrome, as preferred, for color.

Mix dry French yellow ochre, two parts, to one part of dry white lead, then add raw oil enough to make the mass into a thin paint; place in a suitable vessel, and expose it where the sun and air can get at it. The oil will rise to the top of the mass, and in a few weeks it will be fat oil. This is a quicker method than that with just the oil in the bottle.

Boil raw oil in a copper or porcelain-lined kettle, or an iron pot will do equally well, and keep the oil up to 500 degrees F. for three or four hours, then add about ten per cent. of good liquid drier or gold size japan. This makes a thick, varnish-like substance that has to be reduced to a working consistency with turpentine; do not use benzine, as it will not do, nor can you get as good a job over it.

Stir a little red lead and litharge into some boiled

oil; let it stand, shaking frequently, until the oil has bleached. Then bottle it. Raw oil gives a slower drying size.

Here is a very old and very good oil size: Heat raw oil in a pan until it gives forth a dense smoke, then set it afire, let it burn a few seconds, then extinguish the blaze by inverting another pan over the one with the oil in it. Let the oil now cool a little. Have some litharge and red lead in a bottle, and pour the quite warm oil over them. Now place the bottle in a warm place for two weeks, shaking occasionally, say once a day. Then pour off the oil for use. The old-time shop way of boiling oil was in this way, in a pot over the kitchen fire, and when it would scorch a feather placed in it, it was said to be done.

A sign painter tells us that he uses boiled oil, adding a few drops of japan to it, and a little turpentine, when ready to use it. He states that it will hold its tack 48 hours, and make very bright gilding. He has "used it the entire season, with the happiest results."

OTHER SORTS OF SIZE.—A size that can be depended upon for leafing three hours after being applied can be made from finishing varnish, to which add some japan drier and chrome yellow to color. A good formula is one-third japan to two-thirds varnish.

For a size that will do to leaf on in from fifteen minutes to an hour, use the best inside house varnish, one that has a good lustre being best.

A somewhat slower size may be made by adding coach japan to coach finishing varnish.

A quick size for small signs that are on hurry orders, or that must be gotten out of the way, may be made by adding a few drops of boiled oil to an ounce of japan gold size. Add a little lemon chrome for color.

If for quick work, take a medium quick drying var-

nish, add just a little fat oil and some japan, and you have it.

A size that may be used with safety three hours after application may be made from equal parts of finishing varnish and japan drier, tinted with chrome yellow. Perhaps a better formula would be two-thirds of varnish to one-third of japan.

Quick size is used for inside sign work, and here is a good one: Take the best japan gold size and add enough chrome yellow to color it, and also to give it body, and add a drop or two of fat oil, to enhance lustre and increase thickness.

Best copal varnish one pint; gold size japan one gill; best coach japan one-half pint. This takes the leaf in two hours.

Good drying varnish one pint; best coach japan one gill; or half as much gold size japan. This size will do to stand over night.

Good varnish one part; japan gold size three parts; or about three-quarters as much coach japan. This is for quick work.

Mix together one-half pint wearing body varnish, and one pint of coach japan. This is for an ordinary job, it being a moderately quick drying size.

For instant gilding mix together one part of quick leveling varnish and two parts of gold size japan.

SIZE FOR ALUMINUM LEAF.—Aluminum leaf requires a size very much stronger and slower in drying than gold leaf does. It will be found better to use varnish than gold size for this purpose. A little white lead mixed with the varnish is all that is necessary in order to have a good size for aluminum leaf. If the varnish is too slow in drying, as it may be in a dusty street or on a sign that is required more quickly, a little japan gold size may be added to it, with good effect, ac-

according to the wish of the user. The only difficulty in regard to the use of size for aluminum is to know when the proper time has arrived, in the drying process, for the application of the leaf. It need not be as dry as necessary for gold leaf, but it must be dry enough to receive the aluminum without working through it or moving under it. As soon as the size is firmly set the leaf may be applied.

SIZE FOR ALUMINUM BRONZE.—A good size for taking aluminum powder may be made by mixing together any good exterior varnish and gold size japan, adding a little white lead for color. Apply and when of the right tack dust the size and bronze powder. Or the powder may be mixed with the size and be painted on. The former way gives the best effect.

OIL SIZE NOTES.

If the size is too thick it will impair the lustre of the gold.

To slow the oil size add a little varnish, just enough to do what you want, and no more.

For gilding on a window shade use gold size, adding boiled oil, or use a quick-rubbing varnish size.

Use gold size where gilding on wood is to be done, where the leaf must be laid at once.

The size for aluminum or nickel leaf is the same as for gold, only it must be heavier, adding white lead instead of yellow.

For japanned tin signs use the same size as for wood, only it must be very thin, applied with a soft pencil, in order to get it as smooth as possible.

Size may be applied with a bristle brush, where the letters are not too small, but care must be taken that the size is made smooth; a camel's hair brush is usually best.

Years ago the size used was slower than now.

Fat oil makes the best oil size, but it should be tempered with boiled oil, fresh, and japan gold size.

For sign boards, nothing as good as fat oil size, adding a little boiled oil, and chrome yellow to color it.

Use the size quite thin, and for the best effect use it sparingly.

The more time size has for drying, consistent with proper tack, the better the work.

Too soft size will deaden the leaf, but too dry a size will fail to hold the leaf well.

Raw oil size will sweat through the leaf and kill the lustre.

If too dry breathe on the size and quickly apply the leaf.

Best results from a quick size come when it sets in from two to four hours. For such a size use turpentine thinners, working it in with the pencil.

Keep the oil size well corked when not in use.

Some think the oil size is better if made up for use the day before, instead of making it the same day.

A size is thought to be right when it will dry in 24 hours and remain tacky some hours longer.

When you wish to run a very fine line with size always add a little chrome yellow, to prevent the line spreading.

If the gilding is to be varnished over do not use fat oil, but gold size or varnish alone.

Fat oil size for outside use, but get the job out of the shop as soon as possible, or the size will sweat.

Picture frames are given as many as eight coats of gold size for gilding, and it is none too much.

If your size is too heavy it will cause the letters to stand out; the same as regards scroll and all ornamental work.

Too heavy a coat of oil size will sag and make bad work. It will not dry with the right tack, and the leaf will crack as you press it on.

Gold size is easily affected by cold and heat. In cold weather, if the tack is gone, it may be restored by placing it near a fire.

Gold size may be either a varnish or a more elaborate and indefinite composition. In either case it should be a speedy drier and have a tough substance. The former class is preferable, as being definite. In appearance it will answer as a hard to medium dark varnish. An inferior gold size sometimes met with is made up of half-and-half boiled oil and rosin varnish, varied with a little better material to meet the price. The smell is often disguised, but the gluey appearance of the stuff tells of its inferior character.

Use a quick size in winter, and slow with boiled oil if this be necessary; this should give the right tack in 24 hours.

Trouble with the size in summer may be remedied by the addition of a little quick rubbing varnish, which will harden it evenly.

Boiled oil may cause sweating in gold size, hence must be used with care; finishing varnish is safer.

If the size curdles as you mix it for use, or rolls up under the brush or pencil, the fault is with the japan gold size. Get a kind that will mix up with the oil.

Thin fat oil size with gasoline, which will give the very best results. Thin fat oil will give clear-cut edges on letters, it may be applied easily and will be uniform in covering, with a good gloss, as the gasoline soon evaporates and leaves the fat oil in a thin film. You can burnish hard on this size, with raw cotton, getting a fine burnish. Fat oil size is suitable for all exterior gilding, but should never be varnished over.

CHAPTER XXIV.

Aluminum, Leaf and Bronze, and Silver Leaf.



LUMINUM leaf looks handsome on a blue ground, of course, but that is not the only ground it will do well on. It looks very well on a green ground, and some greens better than others. On a green ground, however, it is well to shade with black. It looks very cold and tame on a black ground. It looks well on a red or brown ground, but on a bright straw color, orange or cream, it does almost as well as on blue, and its effect is nearly as good as gold. Fine effects may be had by using the aluminum and gold leaves in combination. This particularly in ornamentation. Aluminum leaf likewise does nicely on light warm tones of green, blue or stone color, in connection with dark shading.

This leaf does not answer for glass work, for it is too stiff and unpliant, being more so than silver leaf. The size for aluminum leaf must be much softer than that used for gold leaf. A good size may be made with half-and-half of gold size and varnish, adding some flake white to color it and give a good background under breaks. The leaf is cheap, so that you need not be so very careful with it, but apply in as large sheets as possible.

Aluminum leaf differs with gold in this, that while gold leaf is independent of the ground that it is placed on, the ground for aluminum leaf must be that which will agree with it as regards color, for, as we have shown, the leaf harmonizes well only with certain colors. This is because gold has color, but aluminum has

not, but is white and cold, as silver is also; but then aluminum leaf has the good quality of borrowing color, so that if we surround it with orange it will be seen to become warm and even glowing with color.

An aluminum letter will look well when shaded with a warm sienna tint. Fine line shading is better than heavy shades. A plain double shade, too, looks well. That is, two shades of the same color run parallel. When this is done, place the lighter shade on the outer side, and you may run this so as to cover all the space that the two shades are to occupy, and when it is dry run the second and darker shade to cover one-half of the first applied shade.

Aluminum leaf will never usurp the place occupied by gold, of course, nor even prove more than a useful adjunct to that precious metal in sign work, but if it is handled properly as regards coloring, very handsome effects may be obtained.

VARNISH OVER ALUMINUM.—The effect of varnish over aluminum is to give it the appearance of white paint. When used for lettering it should be on a flat ground, and either left unvarnished or varnished with a pale carriage varnish. When it is necessary to varnish the ground, cut in with the varnish round the letters and leave the leaf untouched. In using aluminum powder, the same applies; that is to say, apply the powder over the sized surface and leave it. At most, give it a thin coat of gelatine size.

POWDERED ALUMINUM.—Aluminum is taking the place of silver in sign work, owing to the fact that it does not tarnish as silver does, but retains its natural color for a very long time, if not, indeed, an indefinite period. We hear that in England this metal does tarnish under exposure to the atmosphere, and no doubt that where there is much soft coal smoke, as in some

parts of England, as well as in some of our American cities, the metal will become tarnished by the soot attaching to its surface. However, it may be said to be immune in this matter in nearly every part of our country, and certainly holds its color well.

There are several grades of aluminum bronze (certainly not bronze, but powder), costing according to the degree of fineness to which it has been ground, all being perfectly pure, and it is said that the coarser variety, costing least, will show up more brilliant than the finer grade. If you wish to mix the aluminum powder with liquid for application then get the finest powder. If to be dusted on, then the coarser will do. There is an adulterated aluminum, and it will turn dark in a certain length of time.

ALUMINUM SIZE FOR WOOD.—Thin up some white lead that has been ground in oil with good copal varnish, adding a little japan driers, then thin to a working consistency with turpentine. When this size has become nearly dry, having proper tack, apply the powder by means of a soft rag, and to get a nice polish rub more.

LETTERING ON GLASS.—Aluminum powder should be used on the front of the glass, or outside of window, as it cannot be burnished on the inside, and does not look at its best from the inside. Size in the letters with varnish thinned with turpentine, adding a little white lead and driers, and when nearly dry, which stage it reaches according to the drying quality of the size, and which may be anywhere from an hour to twenty-four hours, as you choose, pounce on the powder with a soft rag. The lettering should be done very carefully, so as to show up true, after which the shading may go on, on the outside; it is best to do the entire job on the outside, though it may be done also entirely on the inside. It is

advised, also, to use a quick size for outside work, so as to get the job done and out of danger as soon as possible. For shading use a varnish color, that is, mixing the color with varnish, avoiding japan colors entirely. The same as to black, and for inside work use the same kind of color, first outlining the letters with the black, then putting in the shade. When this is dry, add some aluminum powder to some quick size (never use oil size for this work), and fill in the letters perfectly. When right for the powder, rub it on with a soft rag, and when this is dry back up with sharp lead color. For a first-class job let it stand for several days, then give it a coat of spar varnish, allowing the latter to extend beyond the edges about the eighth of an inch.

For size used on outside work add flake white to the size. For inside work add a little aluminum powder.

SILVER LEAF.—Silver leaf is not used to any great extent in sign work, now that we have aluminum leaf. It is too heavy to lay on glass, although it is done, but only with difficulty. Strong isinglass size is used. Another objection to silver leaf is that it shows the joins badly, though this must be expected of any such heavy and unyielding leaf. It does not give a brilliant effect, but when used can be made effective enough if the workman understands its handling. Compared with gold leaf it gives a cheap impression.

To silver on glass it is necessary to follow about the same line of procedure as with gold, the glass must be made perfectly clean, and when done it must be backed up with a color containing little oil. An English painter tells us that there is no necessity for making the isinglass size so strong, but that it may be used weak, and after the leaf is on let it dry, rub it well with cotton wool, then size and lay a second leaf, and again rub with

cotton. Then touch up any faulty places. For backing up use lead and a hard drying varnish.

Never press the leaf with the thumb, for that will make the leaf appear spotted; use the ball of the hand, pressing firmly, and where two parts come together, or over-lap, pound lightly with the ball of the hand. These remarks apply also to aluminum leaf.

It is impossible to see the outlines through silver, or aluminum leaf, when double leafed, hence a pounce must be used.

Both silver and aluminum leaf will leave rather ragged edges, and by the use of a thin strip of steel, beveled on one edge, laid down on the edge of the work, the uneven parts may be cut or rubbed away, leaving the edge perfectly true. The sizing in should also be made as true as possible.

To remove the surplus leaf add a teaspoonful of muriatic acid to a gill of water, and wet a rag with this, and rub away the leaf. Fluoric acid is perhaps better than the other, but is not essential. Be careful not to get the acid too strong, or it will cause the edges of the letters, or the leaf, to raise. After removing the leaf, remove the acid by careful washing with water.

Silver cannot be beaten out so thin as gold leaf; the thinnest weighs about 23 grams to the square meter, and the specific gravity of silver is only 10.5. This corresponds to a thickness of about one ten thousandth of an inch.

CHAPTER XXV.

Gilding on Glass.



WHEN we reflect that glass is practically non-porous, having a surface offering no tooth at all for paint, varnish or leaf, it is surprising that gold leaf, saying nothing about silver or other metal leaf, should hold so firmly in glass gilding as it does. The size used is a glue easily affected by dampness, and in this respect greatly inferior in staying quality compared with oil size. But it is not uncommon to find a good job of glass gilding wearing well for many years.

Glass gilding is a simple mechanical operation, yet it demands the utmost care and skill in order to produce a durable job; the art side is something else. First, the glass must be made absolutely clean, on the outside, so that the inscription may be marked there with chalk; and on the inside, so that the water size will take, or not creep on the glass. All the tools and vessels used in the work must also be scrupulously clean. The slightest greasiness is fatal to good work.

Clean the glass with whiting and water, let dry, then remove by rubbing with clean cloth; polish with tissue paper or clean woolen rag. A damping off with a sponge wet with alcohol is useful as a final precaution. If the chalk fails to mark good, breathe on the glass and also on the chalk, holding the latter well in the mouth.

The size must be flowed on even, using a soft, wide, camel's hair brush, avoiding air bubbles and specks, which would show up in the gilding.

In leafing a large surface, do not size a space of more than two or three leaves of gold, as the size might dry before you got to it, or partially dry out, and so it is best to apply the size a little at a time, as you proceed with the work. The drying of the size in this way would cause cloudiness of the gilding. Begin sizing in the upper left-hand corner of the sign. Use fresh size each day, as it spoils if kept over a day, particularly in warm weather. Apply the size liberally.

If the size has dried before the leaf got on, then wash it off with hot water; leaf laid on the dry size would show up matt. Hot size is better than plain hot water for the purpose.

THE LAY-OUT OF THE SIGN.—There is more than one way to lay out a window sign for leafing. One way is as follows: Coat the outside of the glass with whiting and water, with a bit of ultra-marine blue in it, for color, and a little mucilage, to bind it. Then with a pointed stick or pencil trace the inscription, which will show up on the inside, backwards. This is a very good way for beginners. Then here is another method: Outline the lettering on a sheet of thin but tough paper, using a heavy black lead pencil, then attach the lay-out to the front of the glass with photographer's paste, applying the paste to the glass, not to the paper. This will allow you to see the inscription plainly through the glass and to trace the letters from the inside. The light from the outside shows through the paper, and even through the gold leaf when that is on, making it easy to outline the letters or fill in with backing-up color, making the letters.

The foregoing way has been disputed by a correspondent, who tells me that the method could be employed only where an outline was first to be used, as pencil marks will not show through the leaf, whereas, chalk marks will. If outlines are to be used on the letters, he adds, the paper may be attached to the inside of the window, and the letters may be chalked on the outside, from the paper that is on the inside.

Still another way: Make a pattern on oil paper, stick on outside of window with gummed stickers, and gild, cut paper off from outside, leaving half of stickers on glass, rub whiting over face of paper, and stick on over leaf inside, having stickers come exactly as on outside, trace outlines of letters with pencil, and you have them on the leaf with whiting. Then back up, wash off, shade and varnish.

SIZING AND LEAFING.—The following are from various sign writers:

Lettering in gold on glass windows cannot be done in cold weather successfully, and in zero weather not at all. This is applicable to all climates where the frost is hard enough to cause frosting on the inside of the window glass, and this will be found much worse on the south side of a street, where the sun does not have access. There are days in winter, however, when a small job can be done, if the job can be finished in one day. As a rule gilding on glass windows should only be done in warm or mild weather.

The water size used is made preferably from Russian isinglass, which see under its head in another part of this work, as also other sizes used. Also method of preparation.

Use a two-inch camel's hair brush for applying the size, and a badger hair tip for lifting the leaf.

Open the book of leaf and bend the paper leaf back far enough to expose the amount of leaf you wish to take up, then draw the nail of the forefinger lightly but firmly across the leaf, just creasing the leaf, not cutting it off. When you apply the tip to the leaf it will cause the leaf to break where you creased it. Lay the tip on to the leaf, and carry it squarely to the glass, and lay it squarely against the space you wish to cover, the space having just immediately before been sized; size only as much space as you can do before the size dries, say two or three letters. Begin at the upper left-hand corner of the sign; a left-handed man would begin at the other corner.

It is important to take up and apply the leaf squarely, and not at an angle, for in the latter case the leaf will surely crack or break. Do not try to lay the leaf exactly on the lines of the letter, but aim to cover every part of the design smoothly as possible, even though you get as much gold outside of the lettering as on the inside, which, by the way, is almost sure to be the case when doing script letter, even when done by an expert. Many good signs can not be read when first gilded. Considerable leaf will be dangling from all parts of the sign, and some of this may be used for patching up broken places; carefully touch up all such parts with a little size and then take some of the loose leaf from the letters or from the book if need be, and touch up with. After the sign is done, allow it to dry, which will take an hour and a half or so, and then brush it off lightly with a camel's hair brush, holding a small box near the work so as to catch the surplus gold.

If the letters do not appear to be nicely covered with gold, it may be necessary to apply a second coat of size and leaf. For a strictly first-class job, a sec-

ond leafing must be done. No matter how well you may lay the first leaf, especially on large letters, the joinings will show and it will have a patchy effect. Double gilding prevents this effect. This is done by giving the gilding a second coat of size after all the loose leaf has been removed by brushing, and allowing it to dry; then with a wad of absorbent cotton go over the gilding by rubbing lightly with a circular motion until the gold appears quite thin and transparent. Then proceed to size and apply another leafing. When all is gilded, patch up if necessary, and clean as before. Then apply a couple of coats of size, allowing plenty of time for drying between coats. Now we are ready for the backing up. Fasten the design on the outside of the glass by means of gum stickers, and, after you are done with the design there, cut the design loose from the stickers, leaving the attached parts to guide you when you place the design in place on the outside of the glass. Then pounce your design onto the gilding, after which you may remove the paper design.

For backing up the design or letters, mix together white lead and chrome yellow, thin with japan gold size and turpentine. Use a sable pencil for this work. Let the paint have several days for hardening in; if you attempt to wash off before the backing gets hard enough it will peel off in places. When it has become quite dry, wash off the surplus gold with a wad of raw cotton and quite warm water. The thumb or finger nail is often used to trim up corners or edges and crooked places; some use a rule and sharp chisel for the purpose. When the job has been nicely cleaned and looks fine from the outside, apply another coat of paint to the backing-up, using usually black or Prussian blue; first outline the letters, and allow the color to extend outside the letters from an eighth

to a fourth of an inch, according to the size of the letters. This serves a double purpose, making the letters look larger and protects the letters from frost and water. When this backing is hard, add a final backing of protective varnish, a good exterior varnish answering, using a sable pencil, and allowing the varnish to extend outside the other backing. This should hold the job for at least two years, when another coat of varnish should be given. The owner should attend to having it revarnished as often as may be necessary, this depending upon the amount of wear and tear the job is subject to. A high-price job of gold sign work is well worth taking care of.

BACKING UP.—What shall the backing-up paint be? Various compositions are used, individual preferences prevailing, and it may with truth be said that after all there is nothing so convincing to a man as his own successful experience. Hence we find quite a number of formulas for this purpose. Thin some japan lamp black with gold size japan, and when it has the right tack rub some aluminum powder over it, as if you intended bronzing the letters. Shade or edge the letters neatly, making the line of a uniform width around the letters, and the backs will look nice, as well as the front.

Mix equal parts of japan gold size and a good, slow drying varnish; grind or work into this mixture some refined lamp black, dry, if you wish a black background, or yellow chrome if yellow backing is desired. Thin with turpentine to work well.

It is thought by one of the most expert glass sign makers that it is a serious mistake to use quick drying color for backing up, saying that in the contraction and expansion of the glass the brittle color is apt to crack or flake off. Some sign painters recommend a mixture of dry lamp black, coach varnish and

japan driers. While others prefer dry chrome yellow, wearing body varnish and japan drier. (Vide Tweed & Rau, Chicago.)

There are two backing-up colors that cannot be improved upon, one being artists' asphaltum in oil, and the other is lamp black in japan, bound in good elastic varnish. (Vide E. M. Lester, sign artist.)

Grind some refined lamp black with palette knife on slab, in spar and rubbing varnish and a few drops of boiled oil. Use only elastic color; use as little turpentine as possible. Make a good stiff mixture with japan lamp black, gold size japan, and a little genuine boiled oil to bind. Let it dry until next day. Then take some very thin tinfoil, the thinner the better; varnish the back of your letters, say several of them with a medium drying rubbing varnish. When it gets tacky, lay a smooth piece of foil on the letter, covering a quarter of an inch over the edge of the letter all around; then lay a piece of paper over the foil and rub the foil down as close to the letter as you can; take away the paper and run your finger over the foil around the edge of the letter. You will find an impression of the letter on the foil. Now take a steel rule or straight edge and a very sharp-pointed knife-blade or a needle (have a small oilstone handy to keep the blade or needle sharp) and follow the edge of your letter all around, keeping a small distance inside of the edge of the letter. Now remove the foil from outside of your cut and the letter is backed up with tinfoil. There must be no foil showing from the front of your job. Now back up the foil and edge line your letter with spar varnish and Prussian blue, or any color desired, and when dry you have one of the best jobs of backing you could put on. Try it. (Author unknown.)

A backing-up that will require no varnish may be

made as follows: Equal parts of tube lead and fat oil are mixed, and to the mass is added a little litharge. Color with any desired color, using tube color preferably; strain the color through fine bolting cloth. If too thick, after straining, thin down with boiled oil.

To dry lamp black add two parts boiled oil and one part turpentine sufficient to form a heavy paste, which may then be thinned down with turpentine, adding a little elastic varnish to bind it. This paint will not come off, with fair usage.

Asphaltum, formerly used exclusively for backing up with, is too brittle, especially for large surfaces; it will do fairly well on small areas. Drop black in japan is also used, but for a sure backing nothing can excel white lead tinted with chrome yellow, to which add a little durable wearing body varnish and thin to working consistency with turpentine. Or, instead of chrome yellow use lamp black, in quantity equal to the amount of white lead used, mixing with turpentine and adding a little raw oil. When this is dry apply a coat of some good varnish, lapping over the letters a trifle.

If the gilding has been properly done, the best coach painter's japan drop black may be used in preference to any other paint.

Speaking of tin foil backing, a sign painter says that he knows of a job that has lasted for 25 years without showing any evidence of deterioration. He presses the foil with rubber roller.

When the letters are to be shaded it is necessary to apply a backing-up color that will not soften under the shading color, and a painter recommends for this purpose dry lamp black mixed with a quick drying rubbing varnish, thinned with sufficient turpentine to produce free working. Or use drop black in japan, thin with turpentine, and add some quick drying var-

nish for binder. This backing can be made to dry hard in from 10 to 12 hours.

If the gilding is single coated, back up with orange chrome yellow and gold size. If double gilded, then use japan black. This has reference to color only; the black might show through the single coat of leaf, is the idea conveyed.

For shaping letters, designs, etc., use one-third chrome yellow in japan, one-third rubbing varnish, and one-third spar, using the best of each.

MATT OUTLINE ON BURNISHED GOLD LETTERS.—Having made your lay-out, pounce it on the glass, and draw the outlines in damar varnish size, and let it dry. Then size with isinglass over all, and lay the gold leaf and burnish as usual. Silver or aluminum leaf may be used the same way. This shows a matt edging or outline, and a bright gold or silver body.

HOW TO CARE FOR TIPS.—The gilder's tip, costing only a few cents, and thus apparently unimportant, plays a very important part, and is worthy of the greatest care and should be kept in the pink of condition. An old book is the best place to keep it when it is not in use. The reason for this becomes obvious when we consider its delicate structure. In the book all its thin, fine hairs are kept in place without disarrangement. And several tips should be kept on hand in case one might go bad. Give each one a separate place in the old book where no one will disturb it, and don't forget where you leave the book or you may have a hunt when you want the tip.

BURNISHED GOLD LETTERS ON GROUND GLASS.—To make a burnish gold letter on ground glass, have the polished side of the glass out (in all cases); make your lay-out on the inside carelessly, just indicating where you have got to lay your gold. Gild the polished or front of the glass with water size, same as

for ordinary gilding on glass, where your lay-out is indicated. When dried out polish the gold with piece of cotton and regild it solid, and when this has dried out, rub it down with cotton. Now letter on the gold with asphaltum, having previously made a careful lay-out of the wording on a piece of paper and traced it on the gold. When the asphaltum has dried take a piece of wet cotton and clean off the surplus gold around the letters; go carefully and clean it well. Now take another piece of cotton and saturate it with turpentine and clean the asphaltum off, and your gold letters are on the glass. The removing of the asphaltum should be done with care and not rub too hard on the gold, and all trace of turpentine and asphaltum should be cleared away from surface of gold and glass. Now shade and high light, or edge line it with quick drying color, and when sufficiently dry, varnish the letters and shading with very pale and good drying varnish, and it is finished, and will stand washing with water many times.

GILDING ON SWEATY WINDOWS.—It is almost impossible to gild a window in winter in a cold climate, and the only time it may be done safely is on a nice day, finishing up the same day, as may be done according to the method given in another place. Restaurant windows, or wherever there is moisture and heat, and poor or no ventilation, there will be sweat on the glass. Under such conditions it is impossible to gild. Some bore holes in the window frame. In some way there must be ventilation, insuring a free circulation of air. Also, do not outline the letters first, but gild and outline afterwards, which will protect the gold; then as the outlining covers letters and glass a little, so too the varnish coat may be made to do the same. This will hold the gold after it is on, but the trouble we are speaking of is sweating of

window, making it impossible to lay the leaf. In cold weather we would not advise the undertaking of a large design, but a small or ordinary job may be finished up in one day, selecting a good day for it. Lester, a New York sign artist, says he knows of a window that has been lettered several times, and each time by a good workman, but it being a sweaty window, each time it was a failure. It finally became necessary to do a job on a plate of glass and set it in the window.

MARKING OUT LETTERING ON GLASS.—In setting out a sign on plate glass, the chalk will not take so readily as on a painted sign. For that reason some prefer to use hardened soap. This will make a good outline, but leave a greasy mark that is almost as hard to remove as when the setting out is painted in black. French chalk is also good, but like the soap, is hard to remove. There is nothing to beat the sticks of prepared school chalk. Sharpen these with a chisel point and the setting out can be done on glass as clean and as effective as with the black paint and pencil, while it is easily removed with a dry rag. If the glass is somewhat greasy the chalk will slip over it and not write easily. To obviate that, before starting to set out run over the whole of the glass with a coat of weak size or strong isinglass solution, which, when dry, will make the chalk bite easily and the setting out can be done with as much expedition as on a painted sign.

French chalk is made from soapstone, or steatite. A pencil may be made from melted beeswax or paraffin, tinted a little with dry color while melted. This is not recommended. Another formula calls for stearic acid 4 parts; mutton suet 3 parts; beeswax 2 parts; then add 6 parts red lead and 1 part purified carbonate of potash. Set in a warm place and stir

once in a while for an hour or so, then pour into glass tubes to form the pencils.

ANOTHER WAY.—The copy prepared before going on the job is done by outlining the design on wrapping paper with lead pencil. Then trace it carefully with a tracing wheel. For script or complicated designs such as may be considered indispensable. The pattern should be attached to the window by means of gum stickers, but if it is a windy day pounce the design on the glass by using a little whiting or ochre in cheesecloth, which gives the outline; then, to make it more plain to gild by, outline it with a sharp pointed piece of Ivory soap.

LAYOUT OF PAINTED LETTERING ON INSIDE.—The inscription is to be painted on the inside of the window, hence the layout would be backwards. You can mark out the letters on the front of the glass with chalk, or soap, or French chalk, then paint them in from the back. Where one is not expert it will be better to outline the letters in oil paint on the outside, doing the work perfectly, then paint in from inside, washing off the front letters with a rag and benzine.

OUTLINING IN BLACK PAINT.—The outlining should show as a dense black from the outside or front, and if it shows gray instead, then the paint has left the glass. To make sure, always clean the glass perfectly. Try a solution of nitric acid one ounce and acetic acid one ounce, in half-pint of water. Rub this well onto the glass, causing some friction. Then wash off with whiting and water, the whiting in a semi paste form, after which clean off and polish with tissue paper.

MATT CENTER AND BURNISHED EDGE LETTERS.—This makes one of the most attractive glass signs the

artist is capable of. The work may be done in various ways, as follows:

ACID EMBOSSED.—By this method the glass must be loose, and then it can be laid on the table and embossed as directed for glass embossing, which see. The glass is coated with asphaltum to protect the parts that are not to be embossed, only the centers or middle parts of the letters being left exposed, and when the acid has been on say an half-hour it will have dulled the surface, using hydrofluoric acid. Now remove the asphaltum with turpentine and a rag or brush, and make the glass perfectly clean. Now size with a water size, as for glass gilding, which see, and lay the leaf over the embossed part and around same for say a quarter-inch, this to form the burnished line around the letters. When dry back up the bright gold part with red lead and gold size, and when this is hard-dry remove surplus leaf from around the letters. Burnish the leaf as usual, on the bright gilding. The middles will appear dull or matt.

Another method is to trace in the letters with a weak form of white acid, which will slightly roughen the glass. The glass is washed and dried and sized with water size, and leaf is laid as directed in the foregoing method. Then the whole letter is backed up with red lead and japan gold size, or any good backing you may prefer. This applies to the first formula also, and in both cases the entire letter is backed up.

VARNISHED CENTER.—For window lettering, where the glass cannot of course be removed, the varnished center letter is used. The lettering is laid out as usual in glass gilding, and then varnish is used for lettering with, leaving a margin around the letters unvarnished, for the burnished gilding. Some apply a

thin coat of whiting and water to the inside of the glass, and form the letters after the whiting is dry, filling in the centers or middle parts with the varnish. A good way is to dampen a small soft sponge and rub the whiting on. The varnish may be a light colored slow rubbing varnish. When the varnish is dry, clean off the whiting and make the glass perfectly clean and bright. Use a camel's hair lettering pencil for applying the varnish, adding a trifle of tube white to the varnish. Thin the mass with turpentine to the required consistency, and do not thin it as you use it. When the varnish is dry it will have tack sufficient to take leaf. But water size must be applied to the work, for the bright parts. It is best to let the varnish dry a day before gilding, but it can be done the same day if necessary.

The gilding covers the matt middle and a margin that is to be burnished. Double leafing is best. Back up as usual. Then you can also place an edging of Prussian blue around the letters, to make them more attractive, and also next to this line you may run a line of light blue, red, or orange. These colors may be mixed in spar varnish. But do this edging after the varnishing of centers, before gilding. After finishing everything else and all is sufficiently dry, which takes about three days, varnish the letters with spar varnish, allowing it to extend an eighth of an inch beyond the letters, on to the glass. This will protect the edges.

For small jobs that are to be gotten out in a hurry, use Damar varnish, or mastic varnish, adding a little zinc white, dry. Copal or any good varnish will answer also.

Have enough color thinned in the cup for the job and do not thin it as usual for lettering. Use camel's hair pencil for light weight colors, like the blacks,

etc., but use a stiffer hair for heavy colors, like vermilion, etc.

When you have large letters to do, say over a foot high, gild the outline first, then back it up and clean off surplus leaf. Then put in the varnish center; let it dry, then gild.

CHAPTER XXVI.

Water Sizes Used in Glass Gilding.



VARIOUS substances are employed in making water size for glass gilding, some having strong adhesive powers, while others are very weak. We have known of water alone being used, though of course the leaf could not be at all permanent when fastened by a size which when dry is utterly absent. In this case, say those who pretend to believe in it, the pressure of the atmosphere will hold the leaf fast, but this is too absurd for belief. Some use ordinary white glue, others gelatine. Mr. Charles Strong, one of the best known sign artists, saying that the chief merit of glue is its handiness, but that gelatine is equally handy, "and attended with infinitely better results." He adds that "isinglass has met with the concurrence of at least nine-tenths of the trade." *The Coast Manual*, a sign painter's book published in California about the year 1907, tells the reader to take four empty quinine capsules to the pint of water, and we find others using the same thing. Surely its use is not to be commended on the score of handiness. Nor should the matter of mere handiness be considered at all, where a good job is in hand. Of which I shall speak at length further on.

A sign painter writes me that he uses gum acacia, five grains to the ounce of distilled water. He adds that he uses this size "very sparingly," and no wonder, for it is simply gum Arabic, and would have to be used that way. He tells me that he has done signs

with this size that have stood for twenty years, the gold retaining its lustre unimpaired. He backs up with gold size, tinged with chrome yellow to a golden color, then gives a coat of Naples yellow, applied quite heavy. He does not advise this size for all grades of work, but has found it "useful, inexpensive and permanent." If this is so, then why not use it for all grades of work?

RUSSIAN ISINGLASS.—This substance is derived from the swimming bladder of the various species of *Acipenser*, of which family the sturgeon is perhaps the best known to us, being very abundant in the Atlantic and adjacent waters. A larger size of this fish inhabits the Caspian and Black seas. The isinglass, as we call this dried bladder, is very tough, and requires boiling for some time in order to reduce it to a proper condition for water sizing, and even long-continued boiling often fails to entirely reduce it. The fact that hard boiling is necessary to reduce it to a size would seem to indicate that when again dried out, as a size under the gold leaf, it would be quite impossible for water, particularly if cold, to affect it, and this indeed is what we find in experience. It makes the most durable size for gilding that we use. Some say that it should be boiled for five minutes, but this depends. Others advise boiling it rapidly for thirty seconds (a book for sign painters, the title of which I have forgotten, tells us this). It is probable that the writer had in mind gelatine or American isinglass. One minute is enough for French gelatine, a very good article, as it really requires only hot water to cause melting.

The amount of Russian isinglass to use with water is not a fixed matter, some using one square inch, others advising a piece the size of a dime, still others the size of a postage stamp, and so on. As a matter

of fact, it requires extremely little, and so little that it is not easy to say just how weak the size may be and still be on the safe side. Experience with it is the best guide.

AMERICAN ISINGLASS.—This also comes from the air bladder of a fish, the hake or sturgeon, but it is entirely different in appearance and melts very readily in hot water. The air bladders are collected in the summer and fall along the coast of Maine, New Brunswick, Nova Scotia and Prince Edward's Island. In the winter this is made up into ribbons and the material looks like tissue paper, crinkled. It is cut into short lengths and tied in small bundles. The bladders are treated by a certain process and run between rolls that are kept cold with ice water. This isinglass is simply a glue or gelatin, and thousands of pounds of it are made and used annually. A price list at hand places this isinglass at 80 cents a pound, while the Russian article is listed at \$3.50 the pound.

THE WORD ISINGLASS.—It is said that the word isinglass is derived from the words icing and glass, both of which have reference to the appearance of gelatin, but some writers on sign painting erroneously state that the reference is to the mineral, mica, which the gelatin isinglass they say resembles. The word isinglass properly refers to the gelatin, not to mica, though the latter is almost always called isinglass. As it is, the word isinglass now may mean either the fish gelatin or the mineral mica, and it would seem to be better to call each and both by more proper names, fish glue and mica.

PREPARING ISINGLASS SIZE.—It is very essential to have the vessel in which isinglass is boiled or prepared perfectly clean, grease especially being injurious, and everything connected with the preparation and use of the gelatin must be absolutely clean. Use

pure, soft water, distilled water being the best, and this may easily be obtained, either from the druggist, or from the teakettle, by conveying the steam from its spout through a tin tube into a suitable vessel, so that the steam may not escape from it, but be confined and allowed to condense, which will be facilitated by immersing the condensing vessel in cold water. Clear rain water, filtered, is very good, and any soft water will do if clean. As stated, the amount of gelatin or isinglass to the pint of water may be anywhere from the size of a dime to that of a postage stamp. Russian isinglass being the stronger will give result with very much smaller piece. Some expert sign painters use and advise the addition of alcohol to the size, some advocating as much as half and half water and spirits, while others, equally expert, condemn the use of the alcohol entirely, saying that it serves no useful purpose, unless it be to overcome any grease there may be in the size, and of course when properly prepared the size will not have any grease in it. It is probable that the alcohol gives a clearer and thinner size, without weakening it. It is well to experiment with it, and so determine its true value in the size.

A porcelain cup is good for boiling the isinglass in, or bright tin, and by breaking the isinglass into small bits its dissolution will be helped. Whether you add the bit of isinglass to a pint or half-pint of water, some using the latter quantity, it should be well boiled, and afterwards well diluted with clean soft water. Experiment will determine just how weak the size may be used and hold the gold fast. If when the leaf is dry it is difficult to rub off, the size is strong enough. If it be easily rubbed off, then the size is too weak. Again, if the leaf shows cloudy, lacking the good lustre, then the size is too strong.

The weak size gives the best lustre. But it must be strong enough to hold the leaf well. After boiling, the size must be strained through silk, an old silk handkerchief answering the purpose; but do not strain it until it has become cool. Filtering through blotting or filter paper two or three times will give the best results, as this will remove every vestige of undissolved matter. The size readily spoils, being an animal glue, hence it should be prepared fresh each day or time that it is to be used. This is one and perhaps the principal reason why most sign painters prefer other than Russian isinglass, the latter is not so "handy" to prepare. French and American gelatin can be made ready for use by pouring boiling water over it, and this is desirable when a rush order comes in, it can be prepared in a minute and is very much less expensive than the Russian article. Of these gelatins one may use a very large piece to the pint of water, some say a piece two inches square.

CREEPING OF SIZE ON GLASS.—When this occurs it indicates the presence of grease on the glass, and hence the glass must be cleaned off and be made perfectly clean, as directed in another place. Finish by cleaning with alcohol, and if this does not cure the trouble, then make new size, and see that everything is clean before beginning.

CHAPTER XXVII.

Glass Signs With Pearl Leaf Enrichment.



THE iridescent hues of pearl leaf, changing with every change of light and the position of the spectator, are very beautiful, and it was a happy thought that prompted some unknown sign artist to employ it in the making of fancy glass signs. Who he was probably is unknown, but he deserves better of fame than this. A generation ago pearl settings in glass signs were much more common than now, and some of the finest glass sign work was done on bank windows, with matt and burnished gilding, and always pearl centers and ornamentation. Pearl admits of being set off by brilliant colors, and black is frequently used for a foil, making the brilliant colors appear to still better advantage.

Pearl comes in thin sheets, these being known as Aurora and Snail, the latter being the handsomest looking, as it reflects in either a concave or convex position, according to the side that is presented to the eye. In cutting the pearl to fit the spaces there will be some small pieces left, and these may be used in filling around the larger pieces. If any ornamentation is to be done, these small bits can be used to advantage there. The rest of the filling-in may be carried out with bits in irregular sizes, according to the spaces that are to be filled.

In making this sign the parallel lines are first drawn with a piece of hard soap, pointed. If the pearl is to be outlined in gold, the same course is fol-

lowed as in ordinary glass gilding. The space where the gold is to show is indicated with black on the reverse side of the glass. The varnish used for fixing the pearl may be either pure mastic, pale quick drying, or a mixture of one-third copal varnish and two-thirds of Canada balsam. Damar varnish also is used. Apply the varnish to the opening, doing only as much space at a time as will allow you to fix the pearl before the varnish has set too much. Let the varnish extend a little beyond the letters.

Be it remembered that the gilding is done first. After that has dried and been finished, set the pearl. Cut the pearl in pieces to fit the space, fitting the leaf close together, and a file is useful here, in giving the leaf clean edges. Use a pair of scissors for cutting the leaf. It is usual with some sign painters to first cut out of tin the shape the filling is to be, or the letters, and thus there is not as much waste as when you cut to fit the sign letters on the glass. Place the pieces on the tin letter, on the table, as they are to be on the sign, and arrange the pieces as far as possible so that the light will be thrown off in one direction only. Also place with convex side up. Then size each piece as you take it up, and place it on the opening in the letter, in its proper position. Press it down hard. This will cause excess size to squeeze out from under the leaf, and the less size there is between the glass and leaf the brighter the leaf will show. Yet enough varnish must adhere to secure proper fastening. Use a stiff, short hair bristle brush for applying the size to the leaf. Try to get a harmony and uniformity of pieces as you lay them.

Any openings left unfilled may now be filled in with the small bits, and if these do not cover all the spaces, then dust on some of the finest of the leaf, and if there is still some openings, this is well, as it will

allow the ground to show through. Aluminum bronze paint makes a good coating over the leaf, to fill in open spaces. Or sift on, if the size will take it.

The ground color applied over the pearl work when done is rather heavy, making a pearl gray lead paint, using japan, turpentine, and only a very little oil.

The sides of the letters may then be shaded, if desired, and scrolls and ornaments may also be put in.

When setting the pearl leaf the workman will from time to time reverse the glass, to note effect of his work, and will if necessary change the position of his pieces.

Most deep and bright colors assort well with pearl for borders, or letter shading, much depending, where several are used, on the order in which they follow each other, as greens with darker greens, reds with browns, purple yellow with brown purple, etc., these being carefully blended; white also looks well.

CHAPTER XXVIII.

Glass Signs By the Transfer Process.



HERE a number of glass signs of the same pattern are to be turned out, the following process, described by J. H. VanDyne in *Signs of the Times*, will be found useful.

Take a piece of plate glass, highly polished, and cut in your sign copy on the glass, backward, with asphaltum, or use the foil process. After neatly cutting in with asphaltum or cutting out of tinfoil, put on your acid and etch the glass to a depth of about three times as much as for an ordinary embossing, say, about 1-32 of an inch. When this is done, clean your glass. Now comes a transfer process, which is applicable for embossing and for backing up gilding, either solid or outline, and for producing outline work of the very finest nature. We presume you have your lettering or design etched on the glass and ready for the transfer. Make a preparation of dry lampblack or ivory black and beeswax, tallow, japan drier and asphaltum gum. Melt the wax, tallow and asphaltum separately, and when in liquid condition mix together with the dry black and japan drier, keeping it hot the while. Any color can be made by substituting the desired coloring matter for the black, but black is mostly used. When this is cold it should be of the consistency of soft putty, and is ready to work. Have a large, wide-bladed knife, about six inches wide and absolutely straight on its edge, not sharp, but perfectly straight and smooth, also a hand brush about two inches wide and four inches long, with fine bristles about three-quarters of

an inch long, and trimmed perfectly level, so that when you lay it on a glass every bristle end will touch the glass. Now some fine tissue paper, in sheets the size of the glass, and a bowl of water with a sponge in it. Now proceed to transfer. Place your etched glass on a table with the pot of color at your right. Take color paste on knife and spread it on etched plate, filling all the letters (same as an engraver fills his work), clean off all paste from the surface of etched glass with the straight edge of spreading knife. Then lay a sheet of tissue paper on the glass which you have just filled with the paste and take a hand brush and rub the paper into the black paste. Now take the glass upon which you are going to put the transfer and lay it flat to the left of your other work. Now take hold of the two corners (two end corners best) and lift the paper from the etched glass and (if the paste is properly mixed) it will draw every particle of the paste from the etched glass and show a neat printed impression of the paper. Lay the paper on the other glass at your left and rub it down on that glass with your hand brush, occasionally lifting your glass to see if it is working all right (in backing up gilding you can not do this). When satisfied it is all right, wet the paper with sponge and water, saturating the paper, and pull it off by lifting it from the corners, and your black paste is on the other glass. Set it away to dry 18 to 24 hours.

This process is used for cutting in letters, designs, etc., for embossing with acid. It is used for backing up gold or silver leaf, either a solid letter or outline letter. It is used lettering on glass in colors, such as red, green, brown, blue, black, etc., and with tinted or tinsel back grounds.

The preparation will dry hard enough to rub roughly in twenty-four hours.

In mixing the color paste, judgment in the quantities of the ingredients must take in temperature, season of the year and locality. A little experience overcomes these difficulties.

While writing this information about the process, at least 25 signs could be transferred or printed.

CHAPTER XXIX.

Painting Signs on Glass.



OLD AND PAINT SIGNS.—These signs can be made with the letters shaded or without. I would prefer the plain letters, with a black background. Now in regard to painting the sign, use plate glass for outside use; sheet glass will do for signs that are intended for indoor use.

First get everything ready before you begin painting the sign; that is, I mean your frame made and the glass fitted, etc. Use oak for making the frames out of, say 3 x 1 inches. The sign is attached to the front of the frame; let the glass down in the frame by grooving out; let it in say about one-half inch. You will want the groove deeper than the sign is thick, so when the sign is ready to go on the frame you can put putty in this groove to keep the water from getting on the back of the sign. Now, after you have made the frame to fit the glass, drill the holes in the glass. Use brass screws to fasten the glass to the frame. After you have everything fitted, the next thing is the painting. Never use any color that has oil in it. Use only colors that are ground in japan. Lay out your design on the front of the glass; if you have more than one sign to make of the same design, it is best to make a design on wrapping paper and trace the letters, using a pouncing-bag to pounce your design on the glass.

I find this always the best if you have more than one sign of the same kind to make. Use a little varnish in

your color. This will prevent it from drying too fast. Be sure that the glass is perfectly clean; use whiting and water, and after rinsing use tissue paper to dry off with. After you have cut out your design, let it dry hard before gilding, say two days. Now after gilding and all patching is done, put two more coats of size over the letters and give plenty of time for drying between coats. You will now be ready for the backing. First use a coat of good varnish, to which add a little chrome yellow. After this is dry put the finishing coats on. Make your finishing as follows: Use keg lead mixed with japan and rubbing varnish; add a small quantity of chrome yellow and thin with turpentine. Now put two heavy coats all over the back of the sign, allowing plenty of time between each coat to dry hard. When the sign is dry, attach it to your frame. For a door sign attach the frame to a drum. A sign made this way will always look good and last a great many years.

WHITE LETTERS ON GLASS.—White paint will look more or less yellow on glass, and to make it appear as white as possible use flake white in tubes, and give as many coats as will make a dense color. Same with common white lead, if you use it. Zinc is white, but it lacks covering power, and is brittle. Shading or outlining with black or other dark color enhances the white effect. Do the outlining first, whether with color or gold, and fill in with white. Silver, nickel or aluminum will make a better white letter, and if backed up solid will show up at night as black lettering.

WHITE LETTERS ON A RED GROUND.—For a transparency sign, to serve by night, white letters on a red ground first make the glass as clean as you would for glass gilding. Take a sheet of glass the same size as the one you are to do, and cover it with tin foil; if not

convenient to have glass, take any suitable material, say a board, of same size. Smooth out the foil on this, and apply a coat of varnish, then give the surface of the sign glass a coat of the same material. Let both surfaces stand until nearly dry, then take the foil and lay it on the sign glass. Then cut out the letters that are to appear on the sign, leaving them remain and removing the rest of the foil. Then clean up the glass, and give two or three coats of red paint. Any other color will do if desired. Be sure that the paint makes an opaque surface. When the paint is dry remove the foil letters and stipple the clear letter spaces with white paint, made stiff with turpentine, and pounce it on, as in window frosting.

TRANSPARENT COLOR FOR GLASS.—For blue, take Prussian blue; for red, crimson lake; for yellow, Indian yellow; for brown, burnt sienna; for black, lamp-black, and so on for other colors. These should be rubbed into a size made as follows: Venice turpentine, two ounces; oil of turpentine, one ounce. Apply with a brush. Fine and brilliant colors are sometimes obtained by dissolving aniline dyes in white shellac varnish; but the objection to these is that they are very unstable, and consequently do not always give the best of satisfaction.

CHAPTER XXX.

Embossing on Glass.



LASS varies in composition, hence it is best to try the acid on a piece of the same glass before beginning the work in hand. If this is not possible or convenient, then try it out on the job, until you get the right strength of acid. Plate glass is better than window glass for embossing on, but for experimental purposes bits of broken glass may be used, and may be procured for little or nothing of the glass dealer. The work must be done on a level and firm table or work bench. Have some small wooden wedges for placing under the glass, to level it if necessary.

Th plate glass must first be made perfectly clean, with soda water, washing and rinsing, then wiping dry with a chamois, after which rub to a polish with tissue paper or silk. Absolute cleanliness is necessary at every step of the work.

Prepare the lay-out or inscription on paper, which is placed beneath the glass. Use the best asphaltum varnish for filling in around the letters, thinning with a little turpentine and some driers to dry and harden the varnish, which is called the "resist," as it resists the acid. Common asphaltum will not be safe; ask for the very best. After you have carefully filled in the plate, leaving the letter spaces bare, let it dry, which will require say a day, to be sure, then examine it for pin-holes, or other defects in the covering, and if any are found apply another coat. It is, in fact, always safest

to apply two coats, and to let it have one or even two days to harden in, as more trouble comes from insufficient hardening than almost anything else outside of grease and poor resist.

The letters may be trued up with a chisel, but this ought to be done before the varnish gets too hard or brittle, in the latter case it would chip. By being very careful when cutting in the letters and making all lines perfectly true no truing up will be necessary. The cleaner and sharper you make the lines the finer job you will have.

When the resist has had ample time to become hard-dry in, lay the glass again on the table, leveled up true and made firm there. Now make a dam about half an inch high all around the edges of the glass, using bees-wax with a little asphaltum in it, to make it more pliable, and be sure that you make the dam perfectly water-tight. See also that the plate is free from dust or other foreign substance.

The acid used in embossing on glass is called hydro-fluoric, and its fumes are fierce, attacking the membranous lining of the nose and throat; so that the work is best done where the fumes will be drawn up and away, as under a specially prepared ventilator, or at a window, or in the open, anywhere that is feasible for doing the work and where there is plenty of free air.

The acid should be diluted a little with water, for if too strong it is apt to cause a ragged effect on the edges of the letters, and if too weak it will not eat fast enough. It is always best to test the acid on a piece of the same glass, when convenient to do so, and the same with the resist, or asphaltum, testing it for durability under the acid.

A satisfactory embossing should be accomplished in about twenty minutes; it should have an icy glare.

Pour out the acid on to the plate until of about one-fourth inch in depth, covering the surface of the work completely. Stir the fluid occasionally, rocking it gently, and after about twenty minutes tilt the plate a little, so that you may see how the work is progressing. It only needs to have the mere face of the glass affected by the acid, for it is to be gilded, and the purpose of the embossing, so-called, is to make a matt or dead surface under the gold. Now, if the work appears to be done, break away a corner of the dam, and pour off the acid into another vessel, not into the one you got it out of; the idea being to keep them separate, using the old next time, and adding some fresh acid to it. Then wash the plate in running water, examine it for defects, and if any are present they must be remedied by re-coating the defective parts and giving it another acid bath. If, however, the work is well done, then remove the wax and put it away for future use. Wash off the asphaltum with benzine or turpentine, and clean up with same. Wash then with soda water, rinse, and wipe and make dry. It is now ready for gilding.

There are several ways of doing glass embossing with acid, some of which are described in this chapter. You may emboss the entire surface of the glass, then gild it all over, making it a matt gold surface. Lettering may be done on this matt surface. Or, after you have embossed the glass, paint in the letters, in black or other suitable color, then gild all over. This will show the letters with gold backing.

The letters on the plain plate glass may have their centers made matt with acid, leaving a plain outline that may be gilded and burnished, the leaf on the middle part showing matt. The outlines of the letters may be

edged with a very fine line, which will cause the letters to stand out.

Fire-flashed glass, that which is colored only on the one side, may be lettered on the color side, with asphaltum, then acid embossing the rest of the surface; this gives a lettering the color of the glass. Or this operation may be reversed.

FANCY ACID EMBOSSING.—To make a pebble ground, cover the glass with small shot, as close as it is possible to lay them on the glass; put on your acid slowly, so as not to disarrange the shot; leave until the acid has cut through the polish of the glass; remove acid and shot; wash with water.

To produce a mottled ground, take a dry sponge and asphaltum; rub some asphaltum on a piece of glass with a soft brush; then dip your sponge in the asphaltum which you have put on the piece of glass and just touch the glass you are working on with the sponge lightly, leaving a ragged spot; repeat this process until your glass is covered to suit you; then apply an acid, and remove when sufficiently etched.

To effect a waving ground, fill a pan large enough to lay your glass in, with water. (If you have no pan large enough, make one of enamel cloth.) Pour a few drops of asphaltum in the water; asphaltum, of course, will float; now, with a stick, stir the water around in different directions, and the asphaltum, floating on the water, will form in waves and curls; when the water has become perfectly still, take your glass (perfectly clean) and just immerse it in the water and lift it out level and you will find the asphaltum is mostly on the glass; let the asphaltum dry and then apply your acid; add a little more asphaltum and stir the water for each succeeding glass.

To produce a ground, pencil the glass with asphaltum, in imitation of the grain of oak, chestnut or ash, and when dry, put on your acid.

To make a good plain ground, use emery sand in same way as shot for pebble ground.

Ground glass, or frosting, as it is also called, may be imitated with white acid, which may be had ready for use, from any large drug house, or may be made from a mixture of three parts of barium sulphate, and one part of fluoride of ammonium, adding very carefully sufficient sulphuric acid to dissolve the ammonium and bring the mixture to the consistency of rich milk. This preparation must be made in a leaden vessel and be kept in a lead or gutta percha bottle. It is best to buy it ready made, as it comes in the sort of bottle described. With this fluid the very best effects are obtained in glass frosting or imitation of ground glass, and other fine effects may be obtained by embossing parts of the work with fluoric acid, which eats smooth, or by making parts matt with fluoride of ammonium slightly aciduated with acetic acid. Glass differs in composition, so that the acids do not act always the same, but differ according to the kind of glass; lead glass is easily acted upon, and gives the best matt surface. With a plate of glass placed in a horizontal position and groats sprinkled over the surface (groats are broken grains of wheat), then pouring over the glass very dilute fluoric acid, a very fine effect will be produced, the parts protected by the grains being raised, while the rest of the glass is matt.

CHIPPED GLASS SIGN.—The commercial method for producing chipped glass is as follows: the design is drawn on manilla paper, and pasted on the glass; the parts that are to be acted upon are then cut out and removed from the glass. This must be done carefully,

in order not to disturb the parts remaining. The glass is then laid flat under a wooden hopper, paper side up, when it is subjected to a sand blast, which embosses or roughens the unprotected parts, while not attacking the paper-protected parts. It is stated that a fall of ten feet will be sufficient to emboss the glass sufficiently, without any other force behind the sand. Now the glass is removed, and it and paper are coated with a strong glue size, made from noodle glue, and about as thick as ordinary varnish. This is allowed to dry at an ordinary warm temperature, and then the glass is set on edge in a rack, in a kiln, which is raised to a high temperature by means of a double row of gas jets near the floor. In the course of several hours the glue will have pulled off the face of the glass in irregular chips, making it look like frosted work. Then the surplus glue is scraped off, and the paper soaked and scraped away with a palette knife.

Chipping may be done in the paint shop by this method: Roughen the surface of the glass with sand and a flat piece of brass, for a rubber, or with a block or smooth piece of pumice stone, which will require but a short time to do. Then clean up and dry. Make a stout size with noodle glue, and apply as hot as the glass will bear without breaking. Now place the glass in an oven heated up to about 480 deg., F. In the course of a few hours the work will be done.

CHAPTER XXXI.

Imitation Frosting on Glass.



HERE are many ways in which real acid etched or frosted glass may be imitated, and the purpose of the work will indicate just which particular kind of frosting should be used.

To frost window glass, done usually to obscure the glass, daub the glass with a ball of fresh putty.

Mix one part of beeswax with ten parts of turpentine, adding one part each of good varnish and japan driers. Stir well together, and daub on the glass with a wad of raw cotton. If color is desired, use the transparent pigments and lakes.

To frost a glass background for a sign, mix some flake white with a little raw oil and gold size, and stipple it on.

Dissolve some Epsom salts in gum Arabic water, and apply to the glass; this does better when the glass can be laid down flat. Pounce with a painter's duster or bristle brush.

Mix lead acetate (sugar of lead) in a mixture of equal parts of damar varnish and turpentine; stipple with this.

Mix one part of dry white lead in a mixture of three-fourths parts of varnish and one-fourth part of turpentine. Add sugar of lead to dry it. Apply the frosting very thin at first, using a broad brush and getting the mixture on as evenly as possible.

This and similar coatings may be removed by a potash or lye solution, or by any paint remover. The *Scientific American* says it may be removed by a mixture of two parts of hydrochloric acid, two parts green vitriol, one part of blue vitriol, and one part gum Arabic, applied with a brush.

Artificial frosting may be done with epsom salts (sulphate of magnesia), mixed with warm water to which some gum Arabic, a weak solution, has been added. The usual recipe calls for beer or ale, but these are not always easy to get, nor desirable. A mixture of vinegar and water, adding a little brown sugar, will do in place of the beer. Give the water all the salts that it will dissolve, making what is called a saturated solution. The glass will have to be laid flat on a table, to get the best results, applying the solution with a soft brush, in a moderately warm room, for the slower the drying the finer the crystalization. Press the frosting lightly with blotter paper, after it has stood a while, to absorb moisture, and when dry give it a coat of very light colored varnish, applied thin. Aniline dye may be added if color is wanted.

A cheap temporary frosting may be made with two-thirds raw oil to one-third pale japan mixed with whiting to a paste, then thinned with turpentine and applied with a soft brush. Then with a ball of cotton wool in a piece of cotton rag daub the frosted glass uniformly all over.

CLEAR LETTERS ON FROSTED GLASS.—A simple and cleanly method is to first rub over the outside of the square with a little whiting and water, and set out the letters by marking the lines and letters with a pencil stick on the whiting as a guide, then outline the letters in black, brown, or gold; when this is dry and hard the frosting may be done, and whilst it is wet wipe off the

inside of the outline; this makes a sharp, clean and readable job. Another method by which the effect is sometimes gained is to use paper letters slightly gummed on one side, wetted, and placed in the position on the glass they are to occupy, being previously set out upon paper, or on the above method, as a guide to place the paper letters. When the whole of the letters are placed and dry the frosting may be done, going over the paper letters as well as the other parts. The frosting should be allowed to dry quite hard. When this is the case, we take a damp sponge and wet the back of the letter; the water will penetrate the paper and soften the gum, and the letters will peel off the glass, and leave the letters sharp and clean cut, care being taken that the frosting is sufficiently hard. Another plan is to cut a stencil of the letters out of ordinary cartridge paper—the thin paper is the best—then frost the window all over, and let it get nearly dry; we then place the stencil upon the frosting, and secure it at the sides all around; we then carefully use a stencil brush, and, holding the paper flat to the glass with one hand, brush out the frosting from the letters through the openings in the stencil paper. This method requires very great care to be used, or else the paper will break up the frosting; for this and other reasons we prefer to use the outline method of doing the work, as it is in the end the quickest and best. If the square of glass can be taken out of its place to be done, or another clear square be used and glazed in against the one already in the window, then we would recommend that the white acid should be used.

CHAPTER XXXII.

Embossing a Brass Sign.



THE BRASS PLATE.—The plate is polished on one side, and must be perfectly free from any dents or other imperfections. In thickness it is of 16 guage, or 1-16 inch, and the plate may be had in any size desired. The price is according to its weight, the charge being made by the pound; as the price of brass varies from time to time, it cannot be definitely stated here.

CLEANING THE PLATE.—As the plate will have more or less grease on its surface, from the handling of it, it must first be washed in sal soda water, made quite strong, after which rinse in clear water and rub dry. This is important, as any grease left on the plate will result in bad work.

MAKING THE LAY-OUT OR DESIGN.—Draw the design carefully on paper, with a lead pencil, then place a sheet of carbon tracing paper on the brass plate, black side down, lay the design on this, face up, then with a hard pointed lead pencil trace the design or lettering, and this will transfer it to the plate. In making the design allow plenty of margin around it, and do not crowd the letters, neither spread them out unduly.

PLACING THE PLATE FOR WORK.—Place the plate on a solid table, one that is perfectly level, or if this is not entirely obtainable, then have some little wedges to level up the plate with. As the acid fumes are highly injurious to the linings of the nose and throat, it is well to provide for their escape into the open air, as at a

window, or in any airy building; in any case avoid inhaling them.

PAINTING IN THE DESIGN.—Before placing the plate in position on the table paint in the design. This is done with asphaltum varnish of the best quality, Syrian, if possible. Some use a mixture made as follows: Take one pint of the best asphaltum varnish, two ounces of beeswax melted in Venice turpentine, and one-half ounce of rosin; heat the mass over a slow fire. If the asphaltum alone is used then add to it a little good japan driers, to make it dry better and harder. Thin to a working consistency with turpentine. Let it dry 24 hours, then apply another coat, which allow to dry for 48 hours. It is important to let the coating become quite dry, for if not so it is apt to curl up under the action of the acid. Two coats are better than one, because in the first coat you may miss some tiny places, which the second coat will be apt to cover, making a solid coating. This coating protects the plate where the acid is not desired to act. Make this coating as thick as you can readily brush on.

MAKING THE DAM.—Make a dam of beeswax to which add a little asphaltum, to make it easier to manipulate, and place this around the edges of the plate, about an inch or less in height, pressing it carefully with the fingers, so that it will be perfectly water-tight.

THE EMBOSSING FLUID.—This is made from one part of nitric acid and three parts of water, but it is always best to try the fluid on a bit of brass before using it on the sign plate, for the strength of nitric acid may vary, so that by seeing just how it acts on a small piece of plate you can better tell about its probable action on the sign plate. If too strong weaken with water; if too weak, add a little more acid. If the fluid is too strong it will eat too fast, causing ragged edges to the work,

while if too weak it will not work fast enough. From a few hours up to a dozen or more may be required, but in any case when the acid has eaten to the depth of one-half the thickness of the plate it should be poured off. Pour on to the depth of one-fourth inch, and watch its action, gently stirring the fluid from time to time, using a feather or small whisk. Also, give the plate a gentle rock once in a while, to disturb the fluid, as it becomes weak where most actively eating the brass. Never pour more acid on, but if necessary pour off the fluid and strengthen it with more acid mixed in a vessel. With a pin try the letters once in a while, to see how deep the embossing is.

ANOTHER METHOD OF EMBOSSING.—Coat the plate with the mixture of best asphaltum one pint, two ounces of beeswax melted in a little Venice turpentine, and one-half ounce of rosin, all heated to melting over a slow fire. Apply a good coating of this, and when it has acquired a right tack lay on it a sheet of lead foil, which press firmly and evenly on to the plate. Now put on the inscription, by pouncing or otherwise, and then, with a stick having a sewing needle fastened to it, cut out the letters, raising the cut-out foil and removing it carefully. Now remove the exposed size from the plate with turpentine, rub it all off clean, and polish the brass. Then emboss with nitric acid as directed in the other case. When the acid has done its work pour it off and wash off the plate, then remove the remaining foil.

ANOTHER AND NEWER METHOD.—Not having received any advice as to the practicability of this process, from sign painters, and not having tried it myself, though it has been recommended by the head of the lettering department of a well known correspondence school, it is given for what it is worth. It is easily

tried out. Coat the brass plate all over, as usual, with asphaltum, let it dry, then paint in the lettering with ordinary oil paint, which will soften up the asphaltum, and then it may easily be removed by rubbing with very fine whiting, that has no grit.

CLEANING UP AFTER EMBOSsing.—After the acid has done its work break away a corner of the dam, and pour off the liquid into a vessel, then wash the plate in clear water, doing this very thoroughly, to remove all traces of acid. Then remove the dam, preserving it for further use, then clean off the asphaltum with turpentine or benzine, make the plate perfectly clean, after which comes the filling in of the letters.

FILLING IN THE LETTERS.—The embossed parts are now to be filled in with a cement, for which there are several formulas, as follows:

No. 1—Add boiled oil to dry ivory drop black to form a paste, adding also some sugar of lead (lead acetate).

No. 2—Add dry drop black to best asphaltum gum, hard drying body varnish, and best coach japan. Heat and melt together. Use equal parts of above ingredients.

No. 3—Shellac varnish 50 parts, turpentine 10 parts, pulverized chalk 40 parts, dry lampblack 12 parts. Form into a paste or putty.

No. 4—Melt together equal parts of gutta percha and the best asphaltum gum in an iron pot, and add to this one-fourth of the bulk of the two ingredients of pulverized shellac. The shellac may be placed in a small bag and hammered until pulverized. Fill the embossed parts with the mass while hot.

No. 5—Mix together in a dry state Manilla copal gum and gum sandarach, equal parts of each, adding a little nigrosine, an aniline black, and enough sweet oil

to form into a paste. Drop the oil into the mass very gradually. Press this into the embossed parts with a spatula, being careful not to mar the plate; it is best to use a celluloid paper knife.

No. 6—If the embossing is very shallow you can fill in with black baking japan, placing the plate in a hot oven, one that will bake bread will do, and bake the japan in.

No. 7—Take four ounces each of best gum asphaltum, brown shellac, and dry lampblack, pulverize the gums, then add the lampblack, mixing all together. This may be melted over a slow fire, or it may be placed dry on the embossing and the plate having been made hot the mass will melt there. Let the same become cold, having filled the embossing surface-full, then pass a hot iron over the work, which will glaze the surface and level it, producing a very fine effect. When cool again scrape away the surplus cement carefully, wash the plate off with water, to which add some oxalic acid, wash in clear water, then polish with raw cotton and dry ivory black.

WHITE CEMENT.—Filling with white cement is done the same as with black, only the cement is made differently, as follows To equal parts of the best coach japan and rubbing varnish add dry zinc white, and work the mass to a putty. Fill in the embossing with this, not quite full, however, though almost full to the level, leaving room only for the coating of flake white ground in japan, thinned with turpentine to a proper consistency, and apply this with a soft pencil or brush. When this has become hard-dry polish it with a soft cloth, by gently rubbing it.

GENERAL REMARKS.—Use the simplest formula that will do the work satisfactorily for you, and carefully observe proportions of ingredients and their manipula-

tion. Press the cement carefully into the embossing, using a celluloid knife to prevent injuring the brass, and passing a heated iron over the filled surface will give it a brilliancy not otherwise obtainable; if this polish is not desired, then omit the heat. Clean off the surplus cement, and clean up the plate with a rag dampened with turpentine or benzine, then wash with oxalic water, dry, then rub to a polish with a dry rag and dry drop black. Use only the best imported asphaltum, gum or varnish. There is some asphaltum that cannot be used at all for this kind of work, that from our own country being of this sort.

NITRIC ACID.—This acid will eat brass, copper, zinc, etc. It will not affect glass, hence may be kept in a glass bottle, well stoppered. It is a highly corrosive fluid, colorless, and has the chemical formula HNO_3 . Found in nature to a limited extent, it is obtained for commercial use by manufacture. Chemically, nitric acid is a compound of hydrogen in which all or a small part of the hydrogen may be exchanged for a metal or a basic radical, forming a new compound. Thus, nitric acid is derived from the decomposition of sodium or potassium with sulphuric acid, the old-time aqua fortis or strong water. It is largely used in the arts for dissolving metals, as in the embossing of brass signs. It has no effect on glass. The vessel containing nitric acid should be properly and conspicuously labeled and kept where it cannot be had in mistake for any harmless fluid. It is a corrosive poison, and when taken internally causes corrosion and bleeding of the parts touched, followed by intense pain, then prostration from shock. It will stain the face yellow, and the treatment is as follows: In one-fourth glass of water place a teaspoonful of whiting, chalk, or even lime scraped from a wall, then give a tablespoonful of castor

oil and one-half pint of sweet oil. For nitric acid burns pour lime water over the burn, or sprinkle baking soda over it; that is the first thing to do. Then, to control the pain, let water run over the burn to remove the soda or lime, then apply some carron oil, which is a mixture of equal parts of olive oil, sweet oil or linseed oil and lime water. Bandage lightly. If the acid gets in the eye, apply lime water, followed later with liquid vaseline, to relieve the irritation. Let the patient remain in a dark room.

COLORING BRASS PLATES.—When it is desired to have the color of a brass sign plate different from its natural color we may proceed as follows: An orange tint inclining to gold may be produced upon brass, which must be highly polished, by plunging it for a few seconds in a warm solution of crystalized acetate of copper. A grayish-green may be produced by dipping the plate in a bath of copper. A beautiful violet color is produced by immersing the metal for an instant in a solution of chloride of antimony, and rubbing it with a stick covered with raw cotton. The plate should be heated to a degree that will make it just tolerable to the touch. A moire effect is obtained by boiling the plate in a solution of sulphate of copper.

MAKING BRASS PLATE CHOCOLATE COLOR.—Take two tablespoonfuls of chrystallized verdigris and dissolve in three half-pints of boiling water. Next dissolve a piece of sal ammoniac about the size of a hulled walnut in three half-pints of water. Then pour the two solutions together and add three half-pints of the best vinegar. Boil well together and filter. The copper article should be well cleaned and polished before the application is made. A wineglassful of the mixture is then taken and a teaspoonful of ammonium sulphide added to it immedi-

ately before using. It is then applied with a hair brush and dried in an oven kept only moderately warm. To secure the uniform adhesion of the fluid a little rouge is added as a binder. Care should be taken to apply the liquid evenly and to dry slowly. From six to ten coats will be required, and with each application the previous coating should be thoroughly covered to prevent spotting. After the last coat has dried in the article may be washed in warm water and then dried. The article should now be heated slowly, which will darken it considerably. If a darker color is required the painting process must be repeated and the article again subjected to heat until the desired color is obtained.

GREEN PATINA ON BRASS PLATE.—Dissolve one ounce of copper wire in 4 ounces of strong nitric acid. When all the copper is dissolved, add 20 ounces of acetic acid, half an ounce of sal ammoniac, and 1 ounce of strong muriatic acid. The brass to be treated with this solution is cleaned and dipped, preferably with a matt dip, and, after rinsing, the foregoing solution is applied to it by means of a cotton swab or by dipping the article in it. It is imperative that the brass should be clean. Within a short time the brass begins to turn a dark, olive green. The excess of liquid should not be wiped off, but must be allowed to remain on the surface. The article is allowed to remain for 24 hours and is then dried in an oven at a gentle heat. The article will then be covered with a dark-green oxidation of "patina," which gives it an antique appearance, but not the corroded appearance of verde-antique. The best results are obtained when the article has been sand-blasted, as the rough surface which is so produced is attacked by the solution better than a smooth surface.

ETCHING ON VARIOUS METALS.—The following formulas are said to be entirely reliable:

Etching on iron or soft steel—Nitric acid 1 part, water 4 parts.

Etching on hard steel—Nitric acid 2 parts, acetic acid 1 part.

Deep etching on steel—Hydrochloric acid 10 parts, chlorate of potash 2 parts, water 88 parts.

Etching on bronze—Nitric acid 100 parts, muriatic acid 5 parts.

Etching on brass—Nitric acid 16 parts, water 160 parts; dissolve 6 parts of potassium chlorate in 100 parts of water, then mix the two solutions and apply.

CHAPTER XXXIII.

Gilding and Painting on Metal.



GILDING A COPPER DOME.—After cleaning off dust and dirt, a wash made as follows should be used: Dissolve some copper sulphate in water, and add some nitric acid, enough to make it quite sour. This will cut the surface of the copper and make a tooth for the paint. Apply two coats of paint, the first one quite sharp with turpentine, with a little varnish to bind it, and the second coat mixed with white lead in oil, and enough French ochre in oil to give a sort of gold color to it; thin with boiled oil. When this paint is dry apply the oil size. A size that will be fit to leaf in 24 hours, but retaining tack for a week, is the kind of size to use. Use patent gold leaf, and take as still a day as possible. Be sure to allow the two paint coats ample time to dry in, say two days each. Half-and-half of oil and turpentine is right, with just enough driers to dry it within a reasonable time. The size may be fat oil thinned with turps, adding driers enough to give proper tack and time. Try the size before beginning work on the dome. If too soft it will impair the lustre; if too quick it will not take the leaf well.

Estimate for each square foot of surface a book and one-half of leaf. It will require about as much size as one coat of paint. Estimate cost by counting time and material for two coats of paint and one coat of oil size, and the leaf; add also cost of cleaning and preparing the dome. The work will cost approximately seventy cents per square foot of surface.

The leaf used is the best gold, and heavier than usual. The fat oil size should be rubbed out thin. Some only wash the copper with a solution of sal soda, rinsing off with clear water. Some advise a paint mixed with yellow ochre and varnish, thinned with turpentine to dry flat and hard. A 48-hour size is recommended by some painters. Gilded copper work when well done will last for ten years or more.

GILDING AND SMALTING SHEET ZINC.—Prepare a mixture composed of one-half ounce each of copper chloride, copper nitrate, and sal ammoniac; place these in a glass or earthen jar and add one quart of soft water, stirring occasionally until the whole is dissolved. Lastly add one-half ounce of muriatic acid. This will make a greening solution sufficient to coat about 500 square feet of surface. Any of the mixture left over may be kept in a stoppered bottle for years, if needs be. This solution does equally well on galvanized iron. Use a broad, soft, flat brush. The surface of the zinc or galvanized iron will at first turn black, but will change to gray in a short time. When dry it is ready for paint. Apply the oil size for lettering and gilding, and also the smalts, all in the usual way.

GILDING IRON LETTERS.—The iron letters must first be put in a bath of hydrochloric (muriatic) acid, then in clear water, and finally in a bath of lime milk. Let the letters then dry, clean off the lime, and prime with some rust preventing paint. Metallic paint mixed with boiled oil is about as good as anything. When dry rub smooth, apply oil size, then gild. Two coats of gold leaf will give a better or more durable job than one leafing.

PAINTING ON METAL.—Paint on copper, zinc, or iron, says an expert sign painter, should have three coats and plenty of time for drying. He adds:

“Where the specifications have called for grounding with red lead on metal where gold leaf was to be used and I have done so, I have not been convinced that it was any more durable than good white lead paint, equally well hardened. If there is any difference it has not been conspicuous in my experience.”

Sheet iron is liable to rust under the paint, and sheet steel is even worse, and to head off the rusting as much as possible rub with raw oil, after having cleaned the work thoroughly. Rub the oil well into the metal. Then rub dry. Prime with equal parts of red and white lead, in oil. On this surface any good paint ought to wear well.

Paint does not adhere any too well to metal, and some metals are worse than others in this respect. If you have a sign to do on such a metal, say zinc or galvanized iron, better corrode it with copper sulphate slightly acidulated with nitric acid. Let dry, then wash off and apply the paint.

A good bronze paint for iron or brass may be made by taking two pounds of chrome green, one ounce of ivory drop black, and one ounce of chrome yellow, and a gill of good japan, and grinding the mass in a hand mill, thinning with raw oil for use.

CHAPTER XXXIV.

Stenciling Signs.



CUTTING THE STENCIL.—The stencil is usually of paper, and for large surfaces this is better than metal. Shellac both sides of the paper, using regular stencil paper, and when dry proceed to cut out. Many use a plate of glass to cut out on, but Atkinson prefers soft wood, saying that one secures a better cut and less wear on the knife. Yet there is the danger of the knife catching in the grain of the wood and making a mis-cut; better therefore to cut on glass and sharpen the knife oftener. On the other hand, Atkinson claims that he can cut a feather edge on board, but this is impossible on glass, and with a feather edge, he says, one may make a cleaner cut letter by the stencil. This is plausible. It is likely that a good even grained wood, one hard rather than soft, would be better than glass or soft wood. Use a knife having a rather thin blade, and whet it frequently on the stone, which should be near you. Cut carefully, making the stencil as near perfect as possible, for what you make it the stencil will make your sign. After cutting the stencil shellac again, to coat the new edges.

MAKING THE DUPLICATE STENCIL.—You will need two stencils, if the tie is to be absent. Cut out slightly more than one-half of the letters on each stencil, the lower half of one, and the upper half of the other. Or, if the letter is of such form that a tie must be left, then cut out such part of one stencil so

that the parts will hold together, then cut out that part in the duplicate that is represented by the uncut part of the other. For rather ornamental or complex stencil designs more than two stencils will be required, and a portion of each cut out, in such a way as to leave no ties. However, any letter may be done in two parts with no tie showing, the letter O being an example, which with one stencil would be out of the question to make without tie.

Also it may be mentioned here that the upper part of the letter may be made one color, and the lower part another, by the duplicate stencil method.

SHADING THE LETTERS.—If shading is required, make another stencil and draw the shades as they are to appear on the sign, cut out this shading, no tie being required. Another way is to shade with the stencil plate by laying it beyond and below the lettering, and painting in the shade, afterwards filling in the angles with a small brush. The bottom shade should be a little darker than the side shade.

CORRECTING ROUGH EDGES.—If, after the letters have been stencilled on the sign, the edges show ragged or rough, run a line of another color along the edges, overlapping them a little. This will not happen with an expert, however.

MIXING AND APPLYING THE STENCIL COLOR.—Color may be applied either by brush or roller. The color for the brush should be mixed rather stiff, using a very little oil, just enough to bind the paint, and thinning with turpentine japan. If japan color is used, thin with a little turpentine. For the roller a thinner color is necessary. The roller should be one covered with felt, as that will hold considerable color, and not part with it too quickly. Fill the roller full of color, and work it on a board, to rid it of excess and make the color evenly distributed. The stencil

for roller work should be thinner than for brush work. About No. 16 Manila is right. If the stencil does not lie flat, give it another coat of shellac.

STENCILING WITH THE BRUSH.—One sign painter says: To prepare a surface for stenciling with a pounce, give the whole surface to be stenciled a coat of varnish thinned with turpentine to the consistency of size and regulated to dry in any required time with a pale drier. When it is dry to a tackiness that is perceptible to the touch, lay on the stencil, pressing it lightly so that every part will touch the surface where it will adhere, and pounce on the color, which should be tied up in a cotton rag in the form of a ball. Do not waste any time or the varnish may dry and you may have some trouble in removing the stencil. Peel the stencil off as soon as the pouncing is done, and clean it at once.

The paint should be flat, or nearly so, as flat paint will leave a clear edge. Mix it stout and use the smallest quantity on the brush that will do the work. The best way is, after dipping the brush, rub some of the paint out on a board. Experience will soon tell you when your brush contains the proper amount to do good work.

Using the brush for stenciling, it is better to rub on the color in a rotary fashion, pressing down firmly, and holding the stencil close to the work. Never pounce with the brush, as many do. Use the color rather dry or stout.

DOING SIGNS WITH STENCIL, ON GLASS, WITH PAINT OR GOLD.—Design your sign on the stencil paper, and cut it out, lay on the glass and fasten it there, then lay in solid with gold leaf. When dry, patch and make dry; the stencil frame must be made fast to a flat bench by hinges, frame fitting the glass loosely. Make a one-inch piece the size of the glass,

and fasten this to the bench, so that the pattern frame will fall directly over it. Now lay the glass, with its gilded side up, on the block, let the pattern fall into position over it, breathe upon the gilding, which will show through the cutting in the pattern, and rub out the exposed gold with a stiff bristle brush; some use an oval horse brush. Breathing on the gilding will keep it moist, so that it will rub out easily. Do all the signs of the lot this way, then rub out through the second pattern the same way as you did with the first. If three stencils are needed, then proceed with the third as with the first and second. See that each stencil registers perfectly on the sign. The rubbing through the pattern rubs away a certain part of the gold, the surplus, and leaves the lettering clear-cut and distinct. Paint the background in oil color, laying the paint evenly, then before the paint is dry sift on some flock of any desired color, which makes the back look neat when viewed from the rear. Such signs are usually made for show case or window.

ZINC STENCILS FOR LETTERING WITH.—Zinc is so much more lasting that where a large number of signs is to be done it is the most economical material to use for stenciling with. Such a stencil may be prepared by coating over one side with wax melted and put on warm. The other side you letter on with asphaltum. Then make a dam around the edges, and pour on nitric acid, same as for brass. As the zinc is very thin it will not take long for the acid to eat through where the zinc is not protected by the coating. Then pour off the acid, remove the dam, wash off in clear water, and wash off coating with coal oil.

MAKING A LARGE STENCIL.—Stencils for large jobs, demanding good wearing quality, may be made by applying two coats of shellac varnish to oiled stencil paper, on one side only, and laying on it some fine

muslin, which press down with a cold sad iron. After which the stencil may be cut, giving a coat of shellac to the face of it. Keep stencils clean, clean off after using, with benzine and a rag. If any paint should harden on it, remove with fusil oil, laying the stencil flat and in the open air.

VARIEGATED STENCILED SIGNS.—A neat and attractive stenciled sign may be made by using a variegated background. This is done by having pots of say yellow, blue, green and red, or as many or few as you may elect, with a brush for each color. Now brush a streak of, say red, diagonally across the board, and which is usually a narrow one for this kind of sign, and follow with all the colors you wish to use, the result being a board covered with diagonal stripes of various colors. These should be blended slightly together where they touch, either by the brush in use, or by a separate one. When dry the lettering may be stencilled on, painting out the ties. This is a favoraite sign in use by paint makers, for stores and tacking up anywhere. Of course you can use tints instead of the pure strong color, if a less striking effect is desired. Again, the colors may be applied through the stencil letters, on a plain background, but this is not quite as convenient a way as the other.

Stenciling may be done by separate letters, or the sign may be drawn in full upon the paper and cut out. It may be well to have a set of letters and numerals on hand, but effective work requires more than one set, so the better way is to make each sign entire as wanted. Where letters are made separate, each one must have a margin about equivalent to the space between letters. Each stencil must have two notches on its left-hand side, one near the top, one near the bottom, as guides, so that the plates may be properly registered.

For small signs of one kind, or stock signs like "For Sale or To Let," the stencil pattern is a great time saver. Rightly used the work will be equal to hand work. It is usual to apply the color with a stencili brush, but the letters may also be traced with a pencil and then be filled in. This gives a less mechanical looking job. A little handwork gives a stencil sign a better appearance where the workman has not been careful in stenciling. A few touches of color here and there, a few flourishes, if the sign admits of a little ornamentation, is not amiss, though of course this will depend upon the price.

The stencil pattern that is designed to paint in the background, being the reverse of the usual stencilled-letter method, has its letters remaining, connected by ties, so that all but the letters and ties are painted in. After the removal of stencil the ties may be removed. If you wish a border in connection with the lettering, form it in the same way as the letters and tie it to the letters at certain points. All of which is easily followed once you get at it.

The color used must not be too quick-drying or it will gum around the edges of the stencil plate; nor too thin, or it will run under the plate and blur the work. A dry, slow drying color is best. Do not have too much color on the brush, but keep it rather dry, and brush out well.

CHAPTER XXXV.

Making Novel or Fancy Signs.



IMITATION OF EMBOSSED GLASS

SIGN.—Take heavy tin foil and spread it on the glass where the letters are to go, place a sheet of paper on the foil, then with a block of wood rub down the foil smooth and level. Now cut out the foil, after pouncing in the letters, leaving the letters showing plain glass, which coat with a mixture of balsam of fir, or Venice turpentine, and Damar varnish, then lay away to set; when it has set stipple it with a stiff bristle brush, which will imitate the embossed effect. Now set it away to dry. Then strip off the foil, gild the letters twice, but do not try to burnish same. After gilding, back it up and leave a plain edge of gold around the letters, outside of the stippling. When the backing is dry, clean off surplus gold and shade letters if desired.

WALL PAPER LETTERS.—Take heavy pressed wall paper and cut therefrom the letters you wish to use, then attach them to the sign board by any suitable cement or paste. Paint or gild these letters, or bronze them, as fancy may dictate. The sign board should be painted or prepared in a suitable manner to form a background for the lettering. This makes a cheap and attractive sign, one useful for any temporary use.

WATER GILDING ON GLASS.—This method is different from the usual way, and may be tried experi-

mentally before undertaking a real job with it. Make up a size with white of egg and water, and filter same. Apply with a badger hair brush, and when nearly dry lay on gold or other leaf, then set aside to become perfectly dry. Then, having prepared a pounce pattern on paper, lay it on the leafing and pounce in the pattern; then trace the lines with a needle point, place the glass in a shallow dish of tepid water, and by means of a stick or the finger remove the leaf from around the letters, leaving the latter clean-cut. The letters should show brilliant and perfect, if the size has not been too thick or heavy.

FLITTER SIGN.—The lettering is first coated with Damar varnish for a wooden sign, or with strong isinglass size if for a glass sign, and on the undry size the flitter or other like material may be sifted. Usually two sizings and coats of flitter are necessary to get a good solid job. Then when dry coat over glass with Damar, then with coach varnish stained the color of the flitter.

FANCY PAINTED SIGN.—Make the ground color, on wood, a light shade of blue, red, or other color, making a light tint of same, and letter in with black, shading same with a color two or three shades darker than the ground color. If a line or blended shade is used, make same two or three shades deeper still.

FLAT COLOR ON VARNISHED GROUND SIGN.—Paint the sign board as usual up to the second coat, which make a tint of the finish coat, say pink tint for red finish, and so on. Then apply the last coat, say it is red, which allow to dry, then lay out the lettering faintly with chalk crayon; then paint in with white or a pale tint, as may be desired. Let it dry. Then varnish the face of the sign, and when this is dry paint in the lettering with the color used in the first place, but making it to dry flat. The flat tint letters

on the varnished ground make a very chaste and attractive sign.

FANCY GOLD ON GLASS SIGN.—This method will give a sign having a gold outline letter with transparent letter and background. Gild and back up the outline in the usual way, clean up, and coat entire space with the background color. Now pass a plush roller over it, giving a stippled effect. Wipe out centers of letters with cotton flannel moistened with water. Then lay in the centers with any desired color, stippling same with a very small pounce of rag.

TIN FOIL SIGN.—It is somewhat difficult to handle tin foil until one gets onto the knack of it. It should be laid upon a piece of glass, or other smooth surface, and the wrinkles smoothed out. Cut out the letters just as they are to appear in the sign. The design should be laid out on the outside of the window, the foil letters placed on the inside, using a stronger size than for gold leaf. First put the size on the letters, then, as they are put in place, lay a piece of paper over each and rub carefully with a soft cotton rag, being careful that every part closely adheres to the glass. Give the back of the letters a coat of varnish, allowing the coat to extend slightly over the edges, the same as is done with gold leaf, so the frost will not affect it. This will also help to hold down the edges. The varnish should not be applied, however, until the letters are dry, and after the shading has been done.

Another way of making a tin-foil sign on glass is to crumple the foil into a ball, then straighten out just enough so as to give it a uniform wrinkled appearance. Then, by means of patterns, cut out the letters and apply to the glass, using a strong size. Use a piece of paper, pressing them firmly to the glass, backing up and varnishing, as before. There

are several different ways to use tin foil in making signs, both on wood and on glass.

FROSTED SILVER SIGN.—Another very novel effect that can be produced at small cost is the frosted and burnished silver sign, with black or other lettering. Take a sheet of steel properly prepared for ordinary painting; lay out with chalk the lettering of your sign, then leave an outline and shade, and before painting in the lettering lay on the background for smalting. Smalt with coarse sand from which be careful to have washed all dust. Dry thoroughly—two or three days if possible. Take a little good quality of mixing varnish and thin with turpentine, about two parts of turps to one of varnish, and pour evenly over the entire surface; allow to dry till just tacky enough for gold leaf, when you will pour over it pure aluminum bronze, applying the bronze about the same as you would smalts. Give plenty of time to thoroughly dry, then brush off all loose powder with a soft brush and paint in your lettering in black or other colors, mixing plenty of varnish in your color. This lettering should not come nearer than a quarter of an inch to the sanded surface, thus leaving a “burnished” outline or outline and shade to the letter.

The effect is a frosted silver sign, the lettering being as distinct and as easily read as a blue and white sign.

It is a strange thing that signs made at the same time of pure aluminum leaf did not stand the test of time, nor did they look as well as those made with the bronze.

CHEAP GLASS SIGN.—Have a sheet of stencil paper the size of the glass, and draw on it your design, which must be perfectly clear. Now, having made up a mixture of fine bronze with varnish, thinned with

turpentine to a working consistency, outline your design or lettering on the front of the glass, and when it is done and dry proceed to shade it. You may run an outlining of black around the letters, then when this is dry go over it with carmine shade, and finally put on vermilion to lap over the other colors as far as you think proper. Other colors may be used in the same way, running in the darkest first. To get the blended effect lay in the bronze as directed, and leave proper space for the shade. When this is dry, apply your colors, with black for the background, for that shows up the colors best, put in the lighter shades first, and when dry go over the inside openings of the letters with transparent colors, which come in tubes; you can use carmine, ultramarine, blue, etc., mixing with varnish, and before this is dry apply tin foil or other suitable leaf, crumple it and lay on the letters.

CHEAP RAISED LETTER SIGN.—Smalt a board, and when dry lay it on a pair of trestles; stretch a chalk line across it, where the line of letters are to go, fastening the line at either end with tacks, the string serving as a guide for the lay-out. Fasten the letters to the board with brass brads. The letters are of wood, gilded.

WATCH CRYSTAL NUMBER.—Take a watch crystal and gild or paint in the number or other device wanted there, and when dry coat it over with desired ground color, then fill up with plaster of Paris. If white ground is desired, then do not paint inside of crystal, but simply fill with the plaster of Paris. This sign may be attached to window or other place with the cement used with enamel letters, made from white lead and quick varnish.

IMITATION PEARL SIGN.—Outline the letters, then fill in with a gray paint, made thin and transparent

with Damar varnish. When this is dry crumple up some tin foil in the hand, cut it to the size of the letter space, first having sized it with a thin coat of Damar. If the outlines are in gold, then the centers may be filled with gold leaf over Damar size, which makes a matt effect. Or the crumpled tin foil may be laid on the Damar size.

SPATTER WORK SIGN.—The board background may be painted white or any light tint, and when dry place paper letters, neatly cut out, or such as may be bought, on the board, fastening same with pins or tacks, and then spatter all over the work with some color darker than the groundwork. When the spatter is dry remove the letters. An atomizer or air spray might do for the work, but spattering is coarser and for some signs better.

NOVEL SMALTED SIGN.—Paint in the letters on a suitably grounded board, and sift on clean sea sand. When dry, coat over with gold size, allowing the size to go a little beyond the lettering, and using a slow size. When the size has the right tack lay deep gold leaf on. In two days cut in with a deep glossy chrome green paint, and smalt this with green smalt. If some red smalt is added to the green you will get a very beautiful effect, but care must be had to keep the red well mixed with the green, as it is heavier than the green, and is liable to fall to the bottom.

HANDSOME SIGN.—Tinge some white paint with ivory drop black and coat a prepared sign board with it, giving a silver gray effect. Letter in with white paint. Shade the letters with gold leaf, close up to the letters. With a glaze of Vandyke brown darken the bottoms of the shade of gold, blending up into the gold until the glaze fades away into gold. Next shade close to the gold shade with two natural shad-

ows of the ground color. If any ornamentation or embellishment is added, let it be in gold.

NOVEL SIGN ON GLASS.—With regard to sign painting on glass, according to a German journal, a new process has been devised, whereby the sign is drawn full size on paper. The letters are then cut out, taking care to keep the edges clean and sharp, and pasted on the glass, in the same position that they occupy on the drawing. The glass inside of the boundary of the sign is then painted with the background color, cutting in sharp round the edges of the pasted-on letters. When the paint is dry, the paper is removed by moistening, and gold or aluminum leaf applied to the vacant space, or colored mica, or thin scales of mother-of-pearl may be scattered over the semi-dry gold size, and finally backed up by a coat of lacquer. Of course, this applies to sign work on the inside of glass windows, or similar places.

SIGN READING THREE WAYS.—This old-timer may be made as follows: Take the sign board and place a moulding around it so that it will extend a little beyond the board. In the upper and lower moulding saw curfs or cuts with the saw deep enough to reach the sign board, and about one inch apart. Prepare strips of tin or sheetiron an inch wide and long enough to reach from top to bottom of sign, which are to be placed in the saw cuts. Now take the tins and paint them on both sides, the color you paint the sign board; it is well to paint board and tins at the one time. Paint the board first, then as you paint the tins on both sides you can slip them into place, where they will dry out of harm's way. When all is dry, letter your board as you wish, then take the tins, previously removed from the saw cuts, lay them edge to edge, on a table, and paint the lettering you wish on them. When dry, turn up and letter what you wish

on the other side. When dry place the tins in the saw cuts.

FANCY MIRROR SIGNS.—There are two styles of the following described sign, the mirror background, and the painted background. For the former procure a bevelled plate mirror the size and shape you wish the sign to be, and paint the back of it with a quick drying paint, to protect the back of the glass; let this get hard and then proceed in the following manner: Sketch letters, scrolls, etc., on the back of the glass—a pricked pounce pattern is, I think, the best way—then scratch out the letters, removing the paint and mirror backing from the glass so that the letters will show perfectly clear when held to the light. Let there be no specks showing in the design or they will show when the sign is finished. The letters are to be backed up in any of the following ways, depending upon the color, of course: If the gold letter is desired, instead of laying in the ordinary gold leaf, use fancy, gold-colored foil; it is much cheaper and looks better. Use fish gelatine, so-called, for size, and if the foil is smooth, crush in the hand so as to form wrinkles—the more wrinkles there are in the foil the richer the letter will appear in the sign. If the foil be in streaks, checks or scrolls, as sometimes happens, it will be unnecessary to wrinkle. It is a good plan to have, if possible, a metal plate with raised scrolls or designs, and, instead of wrinkling the foil, press it over these designs, with weights or a rubber roller, which will transfer the designs to the foil. This will make the scroll-gold effect in the face of the letters.

If it is desired to make the black or other colored letters, with gold or silver border, before laying the foil, paint the letters on the back of those already scratched on the glass, leaving sufficient border to allow the gold or silver to show from the front.

Other designs such as the gold letter with black scroll center, gilt letter with black border, etc., are made by tracing with a fine brush such lines as are necessary, before the foil is applied. But these designs will appear to the one making the sign, but cannot be mentioned here.

The black, or other colored background sign, is made the same way, except, instead of using the mirror, you use the plain glass. The next thing is to back up the sign, and for this you will require a sheet of re-dipped tin, or some such metal, cut as much larger than the sign as will be required to come up over the edge of the glass and crimp about one-fourth inch over front. Now place in any kind of a frame desired, and the sign is ready for delivery.

Glass signs like the above described, outside of glass, cost at the rate of about 30 cents for one 2 x 4 feet, and when done it will look and wear equally as well as most of the chipped glass signs.

CHEAP ADVERTISING SIGNS may be made in many ways, and a very popular one is made as follows: Make your design on paper, and perforate it, so that when placed back to the under side of glass it will show backwards. Now attach to back of glass with gummed strips, and proceed to outline it with fine gold striping bronze, mixed in a little varnish and thinned with turpentine. When this is dry shade the letters. A good effect may be obtained by running a black line shade, then when it is dry put in a carmine shade, then extend shade with vermilion to size wanted. Or you can lay green next to the black, and then a lighter shade of green, always having the darker color or shade next to the letter. To make a blended shade, lay in the background, which should be black or some very dark color, leaving a space for the shading; when dry put in the shade colors, beginning with

the lightest first, and working towards the letter. When dry, paint in the openings of letters with transparent tube colors, such as carmine, ultramarine blue, etc., which mix with varnish, to increase transparent effect; when this is almost dry crumple up some tin foil in the hands and lay it over the letters, which will complete the work.

BAS-RELIEF SIGNS.—For making bas-relief signs use papier mache, mixed with a small quantity of plaster of Paris. This sets very quickly, hence must be used with haste. But the drying may be retarded by adding some arrowroot to the mass, or vinegar, and while the setting will be retarded yet when dry it will be hard.

SUGGESTION FOR A FINE SIGN.—Paint the ground of the sign an ivory white, and set out the letters in pencil so that the setting-out is quite firm and definite; then glaze the letters with a little cerulean blue in varnish, and stipple them so as to get a good transparent, bright blue with a little grain in it. Treat the background similarly but with a little terra verta. When these glazes are hard pounce the sign and write the outline in oil gold-size (or japanmer's, if outdoors) and gild. The letters might be nine inches high and the gilded outlines one-fourth inch wide.

WINDOW SIGN.—A very effective window sign is described as consisting of the main portion of the letters having tin foil reinforced by scrolls of blended green and purple; the letters were block style, and were laid on the inside of the glass, showing as described.

NOVEL STUCCO SIGN.—Cut the letters you wish to use out of common straw board; fasten these to the sign with small tacks. Give the board two coats of paint. After this is dry mix some plaster of Paris with a strong glue size, quite thick, and spread this

all over the sign with a stiff brush. Now take a steel graining comb, or any other device, and corrugate the surface in some design of your own fancy. When this is dry, remove the letters and coat the whole sign with two more coats of paint. Now gild the rough surface with gold and cut the letters in with black. The surface may also be laid with aluminum leaf, and the letters may be cut in with dark blue. Either way makes a very attractive and novel sign, and it is very durable.

Another way is to put the rough surface on with white lead and pumice stone, mark out your design and set in carved wood letters before the surface is dry.

IMITATION EMBOSSED SILVER SIGN.—After finishing the lettering, etc., with gold leaf, which may be shaded with some warm dark colors, put in the ornamental design of the embossing with two shades of silver gray made of white lead tinted with ultramarine blue and black, making one shade a little lighter than the other. When this is dry coat the whole over with clear varnish, to which you have added a little gold size, and while the varnish is still sticky sprinkle over it as much aluminum bronze powder as it will take and hold; this gives it the appearance of a matt silver. To make the mock embossing on the glass under the letters, varnish the design on the glass before sizing on the gold leaf, and where the varnish is the glass will appear to have been embossed.

MAKING CHEAP SIGNS WITH AN INKED PAD.—The following process was described by R. H. Forgrave in *Signs of the Times*, and is here given as an interesting, if not absolutely practical, contribution to the sign painting art:

One of the best and neatest ways to get out a large number of small signs of the same kind in a short

time is as follows: Take a sheet of No. 60 or 70 strawboard, lay off the design, and cut it out, leaving the sheet in the form of a matrix. Fasten this sheet down to a smooth, painted board or glass with paste. Put a frame of one-fourth-inch strips around the edges. Now, take equal parts of glue and molasses, melt the glue in a little water and add the molasses and heat them, mixing thoroughly by stirring. Now, take some lard, and grease every part of the matrix inside the strips of wood, and while the molasses and glue is still hot, pour it into this mould, filling it flush and scrape the excess off with a straight-edge and let it stand until cool.

Take something in the shape of a rocker (half of a cheese-box is all right, if large enough), and nail the ends to a board, putting on a strip of wood for a hand hold. Lift out the sheet of molasses-glue, which will resemble a sheet of soft rubber, and glue it firmly to the rocker. You will then have something similar to a large rubber stamp, with an oval face.

The next thing is the ink, or paint. Stamp ink is good, but rather costly, but, if you are careful, a good ink may be made as follows: Black—Take some lamp black in oil and mix it rather stout with oil, to which should be added a little varnish. For an ink-pad, take a board of suitable size and lay on it a piece of batting cotton of the same size and cover the whole with heavy muslin or light-weight duck. Saturate this thoroughly with the paint.

To make the signs, have your boards or whatever you intend to use well painted and fairly smooth, the smoother, however, the better, take the rocker and rock it backward and forward on the pad until the face of the letters or design is thoroughly covered with the paint, then rock it back and forth on

the board until the letters are well covered with paint. Be careful that the rocker does not slip.

Shaded letters may be made by first putting on the shading with a light color, then putting on a darker color for the face. As the shading must always be put on first, it can not be of a darker tint than the face on account of covering.

In making muslin signs by this method, sized muslin should be used, or, if not, it should be thoroughly sized with starch size and all the wrinkles ironed out. When painting on paper the stamp may be laid flat, and the paper laid on it, using a board and weights to press it down, which should be left on for a couple of minutes.

There is another way to make signs by this plan. Cut out the letters and fasten them to a surface, putting strips around as before and making the stamp. Done in this manner it leaves the letters clear of paint, like those cut in with a brush by painting the ground work.

CHAPTER XXXVI.

Miscellaneous Matters.



SIZE FOR GILDING ON WINDOW SHADE.—Take some good quick oil size, place it in a cup, and add to it a little burnt umber, in oil; this is better than chrome yellow for this kind of work. Let the size stand a few hours before using it, and when ready to use add enough boiled oil to meet the time requirements of the job in hand. The more oil used the slower the setting. This will give a good job of gilding.

PAINTING WINDOW SHADE SIGN.—Make a size from four parts of gelatine to which add ten parts of water; to each gill of size add about 15 drops of glycerine. Size the letters with this, and allow it to become perfectly dry. Do the lettering with tube color, thinning same with turpentine, to make a flat color, and two or three coats are necessary to get a first-class job. In order to get a perfectly flat effect, squeeze out some tube color on a piece of blotter paper, which will extract the oil, or at least the most of it, if allowed time, but will leave enough oil to give due elasticity to the paint. Use a rather stiff and short lettering brush.

LETTERING ON GRANITE.—If we were to apply ordinary oil color for lettering on polished granite or marble, it would run, so that we find it necessary to compound a paint that will stay where placed and also wear well. A simple and effective method is to mix some pure and finely powdered drop black to a

thick paste with equal parts of sugar of lead driers, boiled oil, a little oil gold size, and spar varnish. The varnish adds gloss and makes the paint harder, wearing better for it. Thin to working condition with turpentine. The letters should be coated several times in order to get a good body of paint on.

PAINTING CARVED LETTERS ON GRANITE AND MARBLE.—The most durable paint for this work is made from equal parts of the best asphaltum gum and turpentine, melting over a slow fire, and exercising care that no fire can get to the mass. This is simply a good quality of asphaltum varnish, and a satisfactory quality might be bought ready made. The letters are simply well coated with this preparation.

SIGN PAINTING ON BRICK WORK.—The wall should be perfectly dry before paint is applied, and the best time for the work is in a dry part of the year. Repair holes and bad defects with the following cement: Mix into a paste with boiling linseed oil seven pounds of clean, sharp sand, and two pounds of pulverized litharge. First coat the places that are to be filled with raw oil, then fill in with the cement. Let the cement harden, then go over the entire wall with a coat of raw oil. When this is dry apply a coating of paint made from white lead in oil, thinned with equal parts of raw and boiled oil, and of turpentine one part, adding a little japan to dry it. If the ground coat is to be of any dark color add a little black paint. The work may then be done in the prescribed manner for brick wall painting, for sign work.

GILDING A TOWER CLOCK FACE.—The best wearing results are obtained, when gilding a tower clock face, by first laying aluminum or tin foil over it, gilding over this. The gold leaf will wear better this way than when by itself, even though it were double-leafed with gold.

DOING A LARGE BUSINESS SIGN.—If you are to paint a large, bold business sign, ascertain where it is to be placed. Of course, you would do that, but you might forget to consider that a letter that would look well near the eyes, would not be apt to look so well at a much higher point. I would, therefore, advise you to practice along this line. Make a sign of a few letters, and place it as high as you can, on some building preferably, say at a window. Then from the ground note its appearance, whether the letters have been made too small or not. Most likely they will be too small. The O especially will be faulty, most likely, and will need to be made full and bold. Where a sign is to occupy a high position the letters must be not only large enough to appear readable and proportionate, but all fine lines must be emphasized greatly, in order to show at all. At near view such a sign would look cumbersome and even crude. Hence I advise you to practice this work, so that when called upon for the first time to do a sign for a high elevation you will avoid costly and humiliating mistakes.

HANGING A SIGN.—The man having in charge the hanging of the sign is an important person, for a good sign may easily be depreciated in the hanging. There is always more or less liability of injuring a fine sign in the hanging, especially where the hanging is rather difficult, owing to the character of the position, or height, etc. The hanger should be a skilled man in more ways than one. He should be something of a carpenter, machinist, painter and sailor, the latter particularly. He must be quick to think and even quicker to act, know how to make and untie a knot, have a cool head and steady nerve, with a fine sense of the art side of the business. An intemperate man has no place in this work. A careless man is little if any better than a drinking man. The right

man for the job is a jewel, and worth his price. Many sign hangers possess some of all the good qualities noted here, but very few have them all. And no matter how careful he may be, he is liable to have an accident once in a while. He is liable to let a hammer or other tool fall, the sign is liable to slip and fall, and hence it is always best to warn off passers-by, or not let any pass directly under while the work is going on. It has happened more than once that a sign hanger had left something drop, and of course it must fall on to somebody's head, with resultant damages against the sign boss.

CORRECTING ERRORS ON A SIGN.—When you make a bad spell of it, or make any other error on the sign, correct it as follows: Say it is a smalted sign; then lay a T square at part to be made right, and scrape away the sand and make a clear cut. Clean off scraped spot with a rag wet with benzine. Shellac the part also. Now make your correction and then re-smalt the part. An error on muslin may be painted out with japan white, or with distemper white, giving enough coats to cover perfectly. Some fasten on a muslin patch. On oil cloth or board, remove letters while wet, using a rag and linseed oil for the oil cloth, and the same with addition of benzine for the board sign. Then wash off with soap and water, rinse with clear water, and dry with cloth.

If you chance to make a false stroke on a gold ground, moisten some raw cotton and deftly wipe off at one stroke. Very easy to mar fresh laid gold leaf, by the way.

LETTERING A GLASS CLOCK DIAL.—If it were possible it would be best to roughen or emboss the parts where the lettering is to go, in order that the paint might adhere better. The paint should be applied very thin, yet heavy enough to give an opaque letter.

A thick paint is liable to peel. Letter with ivory drop black ground in japan, and thinned with a mixture of japan gold size three parts, turpentine one part, and boiled oil one-fourth part. A few drops of the boiled oil is enough, the purpose being to slow up the drying a little, and to cause the paint to adhere better.

PEELING OFF OF GILDING ON GLASS.—Complaints are to be heard occasionally of the flaking or peeling off of the gilding on glass signs and windows. This is usually due to the lack of ventilation. The great deficiency of glass as a surface for gilding upon is the absolute lack of grain or of those minute inequalities of surface which key the gilding or give it something to hold to. It also happens quite frequently that the gold becomes moist from the condensation of the moisture inside the office or store. This will naturally have the effect of weakening the mordant which in this case is a water size. A continuance of these conditions will end by destroying the power of the mordant to hold the gold to the glass. The gold will then peel up. The only way to avoid this is to provide some efficient means of ventilation. This should consist of outlets above and below for the escape of moisture where the signs are set in frames or casings. An idea suggested for framed signs for fascias, etc., is to make the back board half an inch less in depth than the opening it is supposed to fill. This should be fitted so as to leave a quarter of an inch at the top and bottom. It is stated on good authority that work put up in this way will stand outside exposure for a considerable period of time.

A SIGN ON A BLACK GROUND.—There are different ways of finishing a signboard black, all of which may be used on different work. The first is finished with ordinary black paint, which may be either common lamp black or vegetable black, mixed in the same

way. This plan is, however, only suitable for use on rough or common work, because a thoroughly good surface can not be obtained in this way. In the second method we first give the sign a bare coat of oil color black upon the three previous coats of brown: we then grind drop black in turpentine, or fine vegetable black, rather stiff, adding enough japan gold size to bind the paint; with this carefully coat the board. When dry and hard, finish with one or two coats of good hard varnish. This gives a good, hard, and glossy surface. The third method differs from the others only in the finishing coats. Instead of using the quick or dead black, as in the last place, mix the black for the last coat, but with an egg-shell gloss, made by using equal parts of oil and turps, or perhaps a little more turps than oil. Give the board a bare coat of this color, and when it is dry give a finishing coat of black japan alone. Carefully done, this will give a fine, smooth and lustrous surface, upon which gold leaf will stand out very brightly. Such a surface will become very hard in a few days. Should it be necessary to give two coats of the black japan, damp the first coat down with a chamois, which will prevent crawling or creeping. Varnish is always apt to do this, making a pin-hole effect on the surface unless it is dampened down.

GENERAL REMARKS.—Never use a flat brush when painting the sign board; use a round or oval paint brush, of good quality. Rub the paint out well, and lay it evenly. The last coat of paint, for the ordinary black and white sign, should be of an egg-shell gloss, not a full gloss, nor dead flat. To wear well the paint coats should be smooth and hard all the way up. Stout paint is best, but you will need to be careful or you will have a rough and uneven ground. After the priming coat use rather little oil, in other words,

make the paint largely of lead, thinned with oil and some turpentine.

LETTERING ON WIRE GAUZE.—For painting wire gauze, lay the gauze on a flat, clean table, and with a large stencil or other square-ended brush, pounce the color on sparingly, not with up-and-down strokes, which fill the meshes. The color, which must be thin, is mixed with turps, driers, and boiled oil; two coats are required. To dry, suspend the blind. Color made with turps and a little gold size is also recommended. Any space to be gilded should be filled up with dry white lead, mixed with gold size and turps. A little dry whiting dusted on the gauze will prevent the gold leaf sticking. For writing on wire blinds, so as to get clear, sharp-edged letters, the paint used should be mixed very thick, and should possess good covering properties. The paint is generally mixed with equal parts of gold size, turpentine and boiled oil, and should be applied very sparingly, otherwise it will run down the wire. Some workers use a mixture of weak glue and whiting for filling it. A simple and reliable way is to paste stiff paper on the back of the wire; when the letters have thoroughly dried, the paper may be easily removed by moistening with warm water. Flat lining brushes are generally used for this purpose. Lines, corners and writing would all be arranged as in ordinary work of the kind. For the corners, it is better to have a stencil, as by this means the corners can be done cleaner and quicker. If it is desired to do away with the traces of the wire, so that the work will be left smooth, it will be necessary to go over the lettering several times with the filling-in medium. The raised effect of gold letters in relief is obtained by gesso treatment, generally with the aid of stencil plates, cut from millboards. The relief may be produced by a mixture of plaster of

Paris and weak size. Of course, the surface must be rubbed down and prepared in the usual manner with gold size before gilding. Another method of obtaining letters in high relief is to take two-thirds whiting and one-third white lead and mix to the consistency of varnish. This may be thinned with turpentine for use. Another way is to add $1\frac{1}{2}$ ounces of alum to a pint of water. Thin plaster of Paris with this medium and apply. When dry, glue-size the letters before gold-sizing them. The latter way will require considerable dexterity.

COLORING ELECTRIC LIGHT BULBS.—Clean the bulb with soap and water, let it dry, then rub with clean soft rag. Beat up the whites of two eggs in a pint of clear water and filter same. Dip the bulb in this, and hang up to dry. For color use analine dye, dissolving it in collodion. Red or blue anilines will give clear solutions, but green will have to be filtered. Yellow will give a frosted appearance to the bulb. Dip the bulb in the clear solution, and hang it up to dry. Use the aniline very thin, and if a deep effect is wanted, better give two or three coats. Water will not affect this coating.

The National Electric Light Association gives the following information on this subject: Lamps of which the glass is permanently colored are the only ones that are thoroughly weatherproof. As such lamps are rather expensive, superficially colored or dipped lamps are quite generally employed. Suitable coloring mixture can be obtained from a number of manufacturers, and the lamps can be readily dipped by any operating company. In this work the old or dim lamps removed from the circuit may be used. The plan generally followed is to burn the lamp in a vertical position with tip down at about two-thirds or three-fourths of its normal candle power. When

the lamps have become slightly warm, take a cup of the dipping solution and raise it slowly until the lamp is submerged therein up to its base; then lower slowly, allowing the excess of liquid to drain off into the cup, and proceed to the next lamp. Lamps should be burned until the coating becomes thoroughly dry and firm.

The most desirable colors for lamps are opal, yellow and ruby. A very satisfactory opal dipping is available and can be employed in preference to frosting in many cases, as the dipping gives a smooth finish, and the surface of the bulb is not so liable to collect dirt and get black as in the case of the frosted bulb. Blue, green and purple are not desirable, as these colors absorb so much of the light that the lamps are hardly distinguishable at a distance.

FIXING WOOD LETTERS TO CEMENT.—If the letters are small, a mixture of tub white-lead and japanners' gold-size or copal varnish made into a paste and run round the top and sides (excluding the bottom) of the letters, using a palette knife, will answer. The letters should be pressed as closely as possible to the surface; but the chief difficulty is to keep them clean, as the putty will squeeze up the sides. If the letters are large they may be temporarily arranged in position, holes drilled and plugged in the walls, and brads used for fixing. These should be driven on the tops of the arms of the letters, so that the bradawl marks do not show. Brass or other plates may be screwed on the back of the letters, the fixing being by means of screws into plugs. The letters are fixed to iron bars or rods 1 in. by $\frac{3}{16}$ in. by means of screws from the back. These in turn are secured to the wall with screws into plugs, or suspended on holdfasts driven into the wall. By the last method the letters may be fixed close to or away from the wall. The iron rods

should be painted the same color as the cement, so as not to be conspicuous.

Raised wooden letters may be fastened from the back, using small screws and washers where the wires intersect; or you may use small staples. To lay out lettering, fasten temporarily at bottom, to form the base line, a strip of wood, say an inch, and place letters on this until you have fastened all to the wires, when the strip may be removed.

GALVANIZED LETTERS may be soldered with galvanized iron strips on to the backs of letters, which cross the wires, or strips and small bolts may be used.

CARVED WOODEN LETTERS on metal or stone sill may be attached by drilling holes in latter and driving wooden plugs into them; thin brass plates are attached to the back of letters, these extending a little beyond the letters, and in the flange thus exposed holes are drilled, to receive the small brass screws which are screwed into the wooden plugs.

IMITATION GOLD PAINT.—The Standard Dictionary, in its color table, the work of an expert color maker, gives 11 parts white, 42 parts orange, and 47 parts yellow. A good formula calls for 60 parts flake white in Japan, 33 parts lemon chrome in japan, 5 parts deep English vermilion in oil, and 2 parts burnt sienna in oil, all by weight. A paler imitation may be made upon this formula: 65 parts flake white, 32 parts lemon yellow, 1 part light chrome green, and 2 parts burnt sienna, all in japan. A strong gold color that will work out light and free under the striping pencil may be made from medium chrome yellow, zinc white and a very little red; add the zinc to the yellow until of a suitable pale tint, then add red to get a gold color. Old gold, mix deep orange yellow with French yellow ochre.

A QUESTION OF LAW.—Who is responsible for work spoiled after being finished? A sign writer is engag-

ed to paint an advertisement on a fixed wall space. This he does, but before dry some unknown person wilfully smears it all over and entirely spoils the work. Who pays for the reproduction—the sign writer or the advertiser? In most cases the sign writer would have to pay, because he is supposed to deliver up the work in good condition. Painters in executing outside work are frequently put to considerable loss by a sudden storm of dust or wind which spoils the job, and in such cases the painter is the sole loser. Sign writers, whenever they have completed work that is within reach, and which some mischievous person may spoil, should throw the responsibility of protecting it upon the party for whom the job is done. Failing an acceptance of the responsibility, an extra charge should be made for temporarily boarding the work up.

WINDOW VENTILATION.—Regarding information on the over-heating, or rather the method of preventing the over-heating of windows in the summer time, I wish to say: You have, understand, two conditions to overcome—in winter, steaming; and in summer, over-heating. To overcome both you will have, of course, to consider and solve them individually. In windows where anything except eatables is shown, it matters not how warm they get in summer, there is only the steaming in winter to fight. Of course in the grocery windows you have this condition to overcome. But even here outside ventilation is not satisfactory. Is not the air in the summer time even warmer on the outside than in the store? Though here you have not two conditions of atmosphere to fight as in the winter—inside and outside—you have only one thing to do, reduce the temperature to the lowest degree possible, and when done without artificial aid that is the temperature of your store. My view is that window backs where eatables

are to be displayed should be constructed in a way to render them removable. Then you can meet the conditions in winter as well as in summer. The grocer removes the front doors in summer to replace them with screens or grating, in order to keep the store cool and well ventilated, and the same principle applies to the window.

TO PREVENT CISSING OF COLOR.—Cissing or creeping of color when lettering on a painted sign board may be due to a too glossy surface, or a too oily paint; sometimes a little turpentine in the color will cure the trouble. If the surface is too glossy, then wipe it off with a damp chamois, rubbing hard, which will of course wipe out the layout. To save the layout, rub over only a part of the sign at a time, re-setting it out before the rest is removed; or do the upper half of the line first, putting back the setting-out before rubbing the lower half. In winter breathe on the work, or rub with the hand, or with a rag or sponge wet with alcohol or warm water. Benzine is better than anything else for cissing.

VARNISHING EXTERIOR SIGNS.—Use the best spar varnish, one having a light color and good body. The varnishing should be put on with great care, so that it will be spread evenly and so not be likely to sag or run. If possible, varnish the sign when it is laying down flat, and leave it so to dry.

HIGH LIGHTS.—Some styles of lettering are benefitted in looks by high lighting, which is simply the running of a fine line on those parts of a letter which are directly opposite to the shade, and so represent the light falling there, as distinguished from the shade, which represents the absence of light. The high light may be either a very narrow or a wide line, though the former is most general; and the color may be either light or deep color. The rule is, a fine line on gold, and a broad line on color.

CHAPTER XXXVII.

Lettering on Glass With Paint.



VERY clever idea for the worker on glass signs, the glass lying on the table, is to have a hand-rest, something like a small stool, by which the hand is kept from injuring the work. The article is 18 inches long by two or three inches wide, resting on supports that raise it about two inches from the glass.

For lettering with paint you will need camel's hair pencils for black and all light-bodied paints, and red sable for the heavier bodied paints, such as white lead, vermilion, green, etc.

Have small tin vessels for the turpentine and paint; also a T-square, ruler or straight-edge, and some bits of glass for palettes; a short half-inch chisel is useful, too.

Use Japan colors; the paint should be made to dry hard, so that it will not work up under the backing-up paint or varnish.

A good black lettering paint for use on glass is made with japan coach black thinned with turpentine and bound with a little rubbing varnish. Or, if you are not particular about it drying quickly, use coach body varnish instead of the rubbing.

The lettering is done on the back of the glass; draw the letters carefully on paper, wet the other side of the paper with kerosene oil, to make it transparent, then lay it under the glass so that the letters will read correctly through the glass and draw the letters carefully, being guided by the paper pattern beneath.

All letters of an oval or rounding form should be drawn true to the outlines; if you do not get the angular letters quite true they can be trued up with the chisel after the paint has become dry. To do this, lay the straight-edge on the letters, and cut away all superfluous paint from the letters. Breathe occasionally on the glass as you cut, or dip the chisel in water now and then, either plan making the cutting more clean.

Then clean up the glass with a wet, not damp, chamois, after which the sign is ready for shading, if it is to be shaded. Or it may be painted solid on the back in some color suitable for a background, or the letters alone may be coated with paint or varnish, for protection. Varnish makes the best protective coating; use a clear copal, and run it a trifle beyond the letters, to protect the edges and keep them from curling up.

To shade the letters, proceed as for the lettering in the first place, by drawing the outlines of the shade onto the letters on the pattern paper, then place the paper under the glass and paint in the shading; trim and make true the shading. Then if desired the background may be painted in solid, or left unpainted.

For a white paint, use dry white lead mixed with pure copal varnish, adding a trifle of ultramarine blue, to take off the yellow cast of the lead. Dip the pencil in the turpentine cup occasionally, which will give a cleaner cut edge to the work. It requires at least two coats of white to make a solid job, and if you paint all over the back, after the white letters are dry, it is absolutely necessary that the letters be painted perfectly solid, or the backing paint will show through them and mar the appearance of the work beyond repair.

The shading may be done the width of the main stems of the letters. All lettering on glass should be well protected with backing-up color, and this may be

made any color you may fancy, thinning with two parts boiled oil and one part turpentine, with a little good drier.

To paint letters on a window, affix your paper pattern to the outside of the glass and paint the work from the inside. Back up the letters as previously described, being careful to protect them with varnish, as they are very liable to be affected by moisture, heat, etc. Do not use thick color on glass, and not much oil in it, as the sun will soften an oil color.

When painting a panel on a glass window, do not go nearer than one inch of the edge of the glass, especially if the background is to be solid black or dark green, and more especially if exposed to the sun's rays. This prevents the heat drawn by the paint from cracking the glass.

The companies that insure plate glass windows have made a very curious but important discovery that will interest not only owners of plate glass windows, but those who paint signs upon them, namely, that black paint will cause the cracking of glass. It is said that the absorption of the sun's rays and the local expansion of the glass about the paint, or any quick or sudden gust of wind will make such a difference in the tension of the glass that it will often crack without apparent cause.

It is necessary to stipple some colors on glass, such as the greens and most mixed colors or tints. When a color is found to not cover well, it is best to stipple it on, using a clean rag or stiff bristle brush for the purpose.

It is safest to use unmixed colors on glass. Here is a list of safe colors: Ochre, Raw Sienna, Cadmium Yellow, Chrome Yellow (light shade), Vermillion, Light Red, Rose Madder, Madder, Pink Madder, Ultramarine Blue, Cobalt Blue, and Prussian Blue. All

the Emerald Greens are good, Burnt Sienna will do, as also Orange Chrome; and you may use Drop Black, Ivory Black, Vandyke Brown and Burnt Umber. Use the madder lakes for tinting white or for glazing. Do not use scarlet lake or carmine. Emerald green is heavy, and should be used with plenty of turpentine, as it is not a good covering paint.

CHAPTER XXXVIII.

Porcelain and Metal Letters.



DOING A JOB WITH ENAMEL LETTER.—There are two or more ways of laying out the inscription, some, who are expert, simply making a chalk line on the glass and placing the letters by the eye; if the workman is not expert he makes a sorry sign of it, as the writer recently saw, a young fellow, apparently the apprentice, attaching the letters in this fashion, without due regard to proper spacing or attention to getting them square and plumb. For such a person it is better to lay out the design on paper, lay the letters in regular order on a large sheet and draw around each letter, then fix the sheet to the inside of the window, from which the letters may be placed accurately. The expert will simply lay out his lines with chalk, and if an oval line is desired hold the line with the left hand, at the bottom, and with a chalk in the right hand, holding it at the end of line, describe the arc of the circle desired. Some lay the middle letter, on a line, and work either way from that, in order to get equal spaces at both ends of the inscription.

Never crowd the letters, and space them properly. The glass must be perfectly clean, or the cement may not hold. As the white porcelain shows very bold, it is essential to the doing of a good job to have the letters perfectly arranged and spaced.

CEMENT FOR PORCELAIN LETTERS.—The most commonly used cement for porcelain letters is made as follows: Take of white lead in oil two parts; dry white

lead three parts; mix with copal varnish to the consistency of putty, then work on a stone or plate glass until perfectly smooth and fine. It should not be too thin when used. This is the cement sold for the purpose and it is perhaps as good as can be made, though there are several other formulas, more elaborate, and which may possess some merits not found in the above cement. The following are of this class:

Starch 80 parts; pulverized chalk 100 parts; mix to a paste with equal parts of water and alcohol, adding also 30 parts of Venice turpentine. Stir the mass well with a broad stick, until it is perfectly homogeneous.

India rubber 1 part; gum mastic 3 parts; chloroform 50 parts. Place in a tightly-corked bottle, and let stand three days or more, until entirely dissolved. As this cement thickens rapidly upon exposure to the air, it must be used quickly. It is proof against moisture, and may be left in water several days, on the letters, without coming loose. Hence it has a special quality that makes it valuable for the purpose.

A common trouble with porcelain letters on glass is that they come loose, partially at least, and sometimes they even fall off, and this is a serious objection to an otherwise very useful form of lettering. The main cause of this is found in the unequal expansion of the glass and cement fastening the letters, and also the metal letters coated with porcelain. The trouble may be overcome largely, if not entirely, by the use of a more elastic cement, and the following should prove reliable.

Slake 3 parts of fresh lump lime in 5 parts of water; melt up 10 parts caoutchouc and the same quantity of linseed oil varnish together, and bring the mixture to a boil. While it is hot pour this mixture over the slaked lime, by degrees, stirring all the time; then filter it

through muslin, and allow it to cool. This cement hardens slowly, requiring about two days, but is said to attach the letters firmly and durably.

Another and similar cement is made as follows: Copal varnish 15 parts; drying oil 5 parts; turpentine 2 parts; liquid glue, made from the least possible quantity of water, 5 parts; melt all together in a warm bath, and add finely pulverized fresh dry-slaked lime 10 parts. Mix to a smooth paste.

When the letters come off replace them with this mixture: 1 part gum mastic, 2 parts litharge, 1 part dry white lead, and three parts raw linseed oil; melt all together, and apply hot.

The best cement for attaching aluminum letters to glass is made from good coach varnish and dry white lead, forming a putty.

REPAIRING ENAMEL LETTERS.—Enamel letters bend and crack very easily, and when the damaged letter is not too badly hurt it may be repaired with the following cement: Mix together 5 parts each of damar and copal varnish, 4 parts turpentine, and alcohol enough to form a thick liquid. Then let the mixture stand for two or three weeks, after which add 6 parts of dry zinc white, mix the mass and work smooth. When required for use heat it, to drive off the alcohol, and apply to the fracture, while warm, smoothing out; when it is cool it may be polished by rubbing with a piece of soft cloth.

TO REMOVE OLD ENAMEL LETTERS.—Wet around the edge of the letters with alcohol, which will loosen the cement, then take the point of a pocket knife and insert it under the edges, very carefully, and thus raise the letters up. It is with difficulty only that the letters can be removed without breakage or some slight damage, but as the cost of new ones is not great it is not such a serious matter. Still, save when you can.

BRILLIANT LETTERS.—These have concave parts, gilded, and are to be attached to the inside of the glass, thus showing the gilding. The metal is thin copper, and the letters have slight edges, which are to hold the letters in their place. Now apply a second coat of cement. The cement should be thin and elastic, and colored with red, to match the gold.

A NICE EFFECT WITH CONVEX GOLD LETTERS.—A nice effect may be had by making a black background, and when this is dry mark the glass lightly to show where the letters are to go; a number of flat pieces of tin are now required, the same size and shade of the letters, less the width of the rim or narrow flange. These are placed on sheets of tin foil, which have previously been pasted to the glass, and the corresponding letters cut out with a sharp knife. They are then painted over in black, which forms the background, and when this is dry remove the letters and place the brilliant black.

GENERAL REMARKS,—Cement is improved by being made a few hours before using. Nothing is better for ordinary use than sifted dry white lead mixed to a putty with the best coach varnish, adding a little dry Indian red to match gold. When not in use the cement may be kept under water, removing all the moisture when wanted again; or it may be kept in a tightly-stoppered jar or can. In cementing the letters and placing them, apply the cement evenly around the edges only, excepting in the case of large letters, and press the letter firmly down on the glass, to expel the air and cause the letter to lie evenly and firmly on the glass. Work the letter gently up and down also, which will further insure perfect adhesion. Clean away any cement that may ooze out, using a knife or pointed stick. Clean up the glass also. The glass must be made perfectly clean

before placing the letters. Be careful not to press a letter too hard, or it may bend or crack. While thus frail, yet when properly placed they will stand good for a long time. If the letter does not seem to lie flat or even, then give it a little more cement, to level it up. Examine the work from the inside of the window, and if an open space occurs, particularly at the top of the letter, so that water can get in, fill the part with cement. Be sure the work is done right before you leave it. If the cement becomes too hard for easy use, heat it, or add a little coach varnish.

CEMENTING BRASS TO GLASS.—This requires a very elastic cement, and such may be made upon this formula: Melt together five ounces of rosin and one ounce of beeswax, by a gentle heat, and then stir in, slowly, one ounce of dry Venetian red, after which remove from the fire and when it is cool it is ready for use.

GLASS LETTER SIGNS.—Not only are letters made for affixing on store windows, but they may be had for making signs on plates of glass, to hang suspended or be attached to any frame, door, or the like. House number plates also are made thus, giving a not very expensive but handsome sign that is easily read. Bevel plate, of double thickness, is used for sign plates, with holes bored for screws, or wire to hang with. Ornaments also are made, and the drug store may have a mortar for attaching to the window. Various forms of letters and numerals are made, with lower-case letters also, so that quite a variety of work may be done with glass letters.

These goods are made in silver, gold and opal. The convex letters have the gold, etc., on the back, burned in the glass, which gives a mirror effect, and the metal cannot tarnish, but must remain bright, nor can it scale or wash off. The figures or letters are cemented to

any surface, and are applied as directed for enamel letters. The goods here described are not the convex kind that are placed on the inside of a window, showing their gilding on the under and inner side, but are made to fasten to the front of a glass or window, the gold, etc., showing through.

The sign painter should make the handling of such signs a part of his regular business, for there is always a good profit in them, some say 100 per cent., and often such a sign will catch a customer when an ordinary paint proposition might not; for instance, a fine sign on plate glass will sell to a physician for \$3.00 or \$5.00, according to size and quality of work, and are pretty sure sellers.

HOW ENAMELED LETTERS ARE MADE.—Enameled sign letters were first made in Germany, but the invention, important as it was, received very little attention from the period of their introduction, about 45 years ago, until about the year 1879, when they were introduced into the United States. A large concern here began then to manufacture the enamel and glass letters also, and although there was no patent to prevent it, there was no competition, owing to the difficulty in making them, the most difficult part being that of getting just the right heat, for if subjected to too strong a heat they will crack, and if, on the other hand, the heat is not strong enough, the substance will not glaze properly.

The enamel is made of oxide of tin, soda and borax, mixed with glass, the whole being reduced to a fine powder. The thin sheet copper letters are first cleaned with a weak solution of sulphuric acid, after which gum water is applied; then the powdered glass, etc., is sifted on, the gum holding it fast. It is next placed in a furnace, which is kept at a very high temperature,

causing the vitreous enamel to fuse and to flow equally over the whole surface of the metal. If properly done the enamel, when cool, will have a peculiarly glassy surface. Two coats of enamel are applied to the face of the letters, and one to the back.

Another way of making the enamel is by mixing 30 parts of saltpeter, 90 parts of silica, and 250 parts of litharge.

Blue enamel is made with oxide of copper; green from chromium, and so on.

CHAPTER XXXIX.

The Electric Sign.



THE electric sign has been in use only a few years, yet its development has been electrical of itself. At first it was made by the sign painter exclusively, though he was obliged as a rule to employ an electrician, for the technical part of the work that he did not understand. The sign then consisted of letters painted on a board, with holes drilled in the board and into which sockets were fitted, this making up the electric sign. Then came electric signs in more artistic effects, with raised wooden letters, but on the same old principle. Then the metal worker got into the business, and it drifted away from the sign painter. With a few letter patterns and some enamel paint the metal worker did the work, or if unable to do anything less exacting he called in the sign painter to help. But the large electric sign makers now have specialists, a designer, sign painter, and so on, the result of which is seen in electric signs quite as handsome as the old-time wooden ones.

For several years the flush-with-surface and raised letters were all that were known in this line of work, then the grooved letter appeared, channelling the light to within its limits. This letter became at once very popular, and is still a very desirable form, owing to its economy as well as appearance. But, while all this, besides being legible at night, it stands aside in the daytime, beside the raised letter. Since the introduction of the grooved letter it has undergone many variations of form, many of them being patent-

ed, but they cost more than the original type, and do not offer advantages to offset this increased cost. The bevelling of the walls of a letter in or out, or breaking an edge, with the necessary fittings, etc., adds greatly to the cost of a sign, and must prove of unusual advertising value if it takes the place of the simpler and less costly sign.

One of the improvements of decided merit was that of John Hotchner, a practical sign man of San Francisco, who obtained a patent on his device March 30, 1908. It became at once the subject of infringements, law suits followed, and after months of legal fighting in the Courts, the inventor gained the day. This sign struck the public fancy immensely, and yet the idea was so simple that the wonder is that it was not thought of sooner. In its make the services of the sign painter becomes necessary. It is known as the Shedlight sign. It is a strictly modern sign, made to wear, both as to its material construction and form. It may be described as a flush letter on a metal plate, with a wall of about $1\frac{3}{4}$ inches high, soldered on the top and on one side of the elements of a letter, where the sign painter would paint in the high-light, with the shading painted in the opposite and usual direction. This does away with more than one-half the work of a grooved letter. A reflector throws the light in the direction of the shade, exposing a beautiful, legible and artistic effect of the more costly raised letter. Varied styles of block and split shades in gold leaf and colors are used. In brief, this sign has all the merits of both the raised and channelled letters, with advantages over both as a daylight sign.

It is not necessary here to give an extended account of the manufacture of electric signs, for it is a distinct branch that has hardly any interest for the sign painter beyond the fact that he is occasionally

called upon to assist, or maybe has a contract for putting up an electric sign for a customer. In the latter case he will seek out some good electric sign maker and make a contract with him for the work. But there are many facts in connection with the work, from a business standpoint, that the sign painter should know. He should be able to impart some correct information to a customer, for instance, giving data as to the various styles or designs, for there are some better adapted to certain purposes than others. Then he will want to know about what the cost will be, and while this is given in detail when accepting a contract, the figures being obtained from the sign maker, yet before going this far with the deal the client will want some idea of the cost approximately. First let us consider the character of the sign, what it is best adapted to do.

WHAT SIGN TO USE.—If it is the desire of the user that the sign also serve to illuminate the sidewalk and street, a raised letter will serve to better purpose. But a raised letter, as a rule, can not be read at as great a distance as can a grooved letter, nor can it be read at so great an angle, unless the letters are made unusually wide and far apart. The raised letter sign is best where non-electric letters are also to be used. A few more lamps are necessary for the raised letter, but this is not, as a rule, a large item.

The grooved letter sign is the proper one to use where there is special desire that the sign be readable for a great distance. This letter, because of its distinct outline, may be read from any angle. The cost of maintenance is, of course, less, as fewer lights are needed, hence less electric current is consumed.

For roof signs the grooved letter is more desirable, as readability at a distance is generally the main point aimed at by the user of a roof sign.

COLORLED CAPS.—Brilliant effects for electric signs are now to be readily obtained with little cost by the use of small colored transparent caps which fit over the rounded ends of the incandescent bulbs. This permits the owner of a changeable electric sign to alter the legend at will and to indulge in the use of colors without the necessity of keeping on hand a large supply of colored lamps, some of which are very expensive.

COST OF MAINTENANCE.—The price of an electric sign often strikes the merchant or other person contemplating buying one as being excessive, as the cost may run anywhere from \$100 up to \$10,000, the cost being based on the skilled labor expended, and the material used. But when he buys space, say in a popular magazine, he pays for circulation, and pays what might well appear to be excessive rates. The printed adv. may last two months, at best, while the electric sign lasts for years. Then he may buy a sign costing as little as \$20, one made of glass with metal frame, and carrying several lamps inside. But whether cheap or costly, a good electric sign will last five years at least and be as good at the end of the period and capable of giving as good service as at first.

The methods of the advertising agencies which exploit the electric sign are interesting, and certainly business like. Their specialty is outdoors advertising, and their solicitation for business is not commonly based so much upon one sign or bulletin as upon a combination or group so prepared and distributed among the business, residential and traffic districts as to meet the exact needs of every individual advertiser. For instance, for \$500 monthly, according to the price list of one agency, an advertiser may have twenty-six bulletins so distributed as to cover all Manhattan with an assured circulation of

4,000,000; for \$1000 monthly he may have forty-nine bulletins; for \$1500 monthly fifty-eight bulletins; and so on.

For only one dollar a day an advertiser may secure five railroad bulletins 10 feet high by 48 feet long, on any of the roads entering New York, and assuring a circulation of 100,000 to 150,000 daily. For \$2.00 to \$2.50 a day, he may secure five large painted bulletins in the best residential districts in the city. If his proposition admits of so great an appropriation as \$1500 a month, he may secure three illuminated bulletins on Broadway, between Fourteenth and Forty-second streets, with a circulation of 700,000 daily; one illuminated bulletin at Grand Circle, Fifty-ninth street, with a circulation of 200,000 daily; one illuminated bulletin on One Hundred and Twenty-fifth street, with a circulation of 250,000 daily; one special downtown bulletin, prominently located, with a circulation of 300,000 daily; two at Brooklyn Bridge, with a circulation of 500,000 daily; twelve along "L" railways (Second, Third, Sixth and Ninth avenues), with a circulation of 200,000 daily; one at Twenty-third street Ferry (west), with a circulation of 100,000 daily; two on prominent driveways, with a circulation of 75,000 daily; and thirty-five in the residential sections with a circulation of 100,000 daily.

The diversity of the combinations is thus practically without limit. Within certain bounds an advertiser may spend as much or more or as little as good policy will permit, and the comforting knowledge may always be his that his advertisements are working every minute of the day and, in the instance of illuminated bulletins, through the long hours of the night. With such a field to choose from, it should not be possible that any advertiser, wholesale or retail, national or local, could fail to select a combina-

tion exactly suitable to his needs. The elasticity of electric advertising appeals to him as a business man.

The cost of using the average high-grade electric sign, with 16-inch lamp letters, on both sides, burning scores of 2-candle-power lamps from dusk to midnight six days per week, is only \$5 per week, or \$260 per year—just about one-quarter of the difference in rent, and the net saving is \$740 per year plus additional profit from the increased business.

These figures are based on sign costs in Chicago, and include patrol switching and maintenance of service.

ROOF SIGNS.—Roof signs may be made in any size up to a dozen feet or so. Wire the front of the boards, and put on as many sockets as you can. Paint the frame black; the frame may be made of 2 x 4 stuff. The wooden letters, formerly made in the shop, may now be bought ready-made at a saving over shop labor, and in any desired form or finish. After the frame-work is up the letters may be nailed to the frame. The letters may be painted white on the face, and any color, using good paint, on the back, to keep from warping. The frame-work must be well made and well braced, and where the braces are nailed to the roof they should be well painted or tarred.

A sign may be made on the usual sign board, for using in front of place of business, by cutting in the white letters with black background, then placing the sockets in the letters.

Very large letters may be made of flooring, and should be well cleated on the back.

CHAPTER XL.

Tin Tacking.



HIS is hardly to be included as part of the sign painter's art, inasmuch as the tin tacker simply places ready-made signs, and does not paint or make them. Still, in a measure the work may be considered as at least distantly related, if not a near blood relation, and hence is not uninteresting to the sign painting fraternity.

The tin tacker belongs to a considerable body of men who have an association and thorough organization, doing business in a very business-like way, and the following account given by an expert in *Signs of the Times* will prove both instructive and interesting to the sign painter:

I will endeavor to give you an idea of how we do business. First, we make it a point to write to every national advertiser at least once monthly. Frequently they write and ask for our prices. Some never reply to our letters, others will write and say that they are not advertising our territory at that particular time, but will take up the matter with us as soon as they are ready.

We use the Robertson Magnetic hammer, and, to go slightly into detail, fill the mouth with tacks (using York tacks) and tack from the mouth. We have our right-hand coat pocket lined with heavy canvas and keep it well filled with tacks for immediate use. The bulk of our tacks, of course, we carry in a shot bag, which may be obtained from any hardware store. We

always start to work at seven o'clock in the morning and quit at five o'clock in the evening, allowing one hour for dinner. Assuming that we have a 28-tack card, we place seven tacks along the top and then four rows underneath; in this manner, after tacking a few, you will gradually get all the tacks the same distance apart and will not have to count them. We use the Williams folding ladder, because it is easy to carry in a buggy in case we are obliged to make a long drive, and it is also light to carry on the streets.

In going from house to house, if we desire to get permission to use some one's premises for tacking purposes, we approach the house that we think such premises belong to, knock, and if a lady answers, we take off our hat and bid her the time of day; then ask her, always saying "please," and if she grants us permission we always thank her. If she refuses, we tell her that signs will not injure her property and that we only intend to tack one. Nine times out of ten you will get permission if you go about it in the right manner. Then, on the other hand, if a man answers the door, we eye up the situation in a minute, and if he looks like a clerk or a man with money, we ask him in the following manner: "Please, may I tack a sign on your shed?" —making our request in this manner we appear as his equal. If perchance he happens to be a laboring man we say, "Can I tack a sign on your shed?" In this manner we simply tell him that we are not placing ourselves higher than he.

We make it a point not to let our competitors get a better showing than we do. If one of our men can not get a showing that has been given one of our competitors, we leave it go a day or two, then another one of us will try it.

In tacking tobacco signs, etc., we always aim to get a sign as near to a grocery door as possible; a

sign placed in such a position will attract the purchaser's attention last and cause him to ask for the goods that we are tacking, and in this manner the increase of sales of the goods that we are advertising rebounds to our credit. This also gives a salesman no chance to write to his house that he can not find our work.

Pole tacking is prohibited in some towns, in which case we leave them alone, as in tacking them in violation of an ordinance we would simply invite more drastic legislation. Then in some of our towns it is permitted, in which case we never tack signs in customary places, that is, from five to seven feet high, as there is always some greenhorn who will cover them almost as soon as they are tacked. We always aim to get them higher than the average, or else for the most of the time we do not tack them over one foot from the ground. We tacked signs in this manner over a year ago in some towns, and they are still up; and some that we had tacked in customary places are down long ago and forgotten.

Another thing in favor of tacking a sign one foot from the ground is that a man never looks at the top of a post, and there is not a man on earth who does not see the bottom of one, say second or third post in front of him. Try it and see if I am not correct. The reason for putting it a foot from the ground instead of entirely at the bottom of a post, is that the rain and snow will not damage it. If it is placed too near the ground the sign will soon become splashed and especially after the first rain will look dirty.

We also notify the advertiser daily, by mail, what territory we have covered. This information enables their inspectors or salesmen to know just what route to cover. After completing a job, we at once send the advertiser a bill and a list of the locations of their

signs. We believe that this is something that nearly all sign tackers overlook. We list them in the following manner:

Road from—

Wheeling, 1st ward.	No. of signs....
2nd ward.	No. of signs....
To Bellaire	No. of signs....
Bellaire, 1st ward.	No. of signs....

In this manner the advertiser knows exactly where to locate his goods. If we have any signs left over we notify him as to the number, etc.; then inform him as to adjacent territory, class of people living in this territory, whether industrious or not, and nearly always he will give us instructions to tack this adjacent territory.

We always keep our signs clean when tacking, and we do not tack in rainy weather. We carry them in a waterproof sack, as signs cost money and take on a dingy appearance soon enough without being misused or carelessly handled by sign tackers. If an inspector calls upon us we take him around and show him our work and ask him to pass his opinion on it.

I trust that the foregoing will be of some interest and assistance to members of the Brotherhood of Sign Tackers, and will conclude by giving one more pointer: Never tack signs in narrow back alleys; it does not pay.

CHAPTER XLI.

Cleaning and Renovating Old Letters, Etc.



RENOVATING OLD GOLD LETTERS ON GLASS.—To restore the lustre of gilded letters on glass, wash them very carefully with a weak solution of muriatic acid. The simple removal of the accumulated dirt and grime restores the color of the gold, and this is what the acid does.

REMOVING PAINT FROM GLASS.—Paint marks on glass containing lettering may be removed by coating the glass with a paste of whiting and ammonia, using it when in a cream-like state, this being done with water; allow the whiting paste to dry on the glass, then wash off with soap and water, after which use the chamois, and, when dry, polish with tissue paper.

RENOVATING A PICTORIAL SIGN.—If the sign has not suffered much exposure to the weather, it may be washed off with soap and water, or water to which add a few drops of ammonia water. After which wash off with clear water. When dry give it a coat of good varnish. It may then be touched up wherever this may be required, and if all has been done skilfully the sign will look like new. If the sign has suffered from exposure, and is cracked, blistered or otherwise injured in its coating, it will be a saving of time to repaint it on a fresh ground. Pictorial signs, requiring many colors, are apt to fade more or less in a short time. If the sign is worth it, being a good job, it may be restored by painting over and following the old colors. If the sign has been done on iron it will likely

be more difficult to renovate than when on wood, as iron contracts and expands and seriously impairs the paint, usually causing it to scale. In such a case it would be well to take a tracing of the design, and repaint the work afresh.

CLEANING RAISED GOLD LETTERS.—To clean raised gold letters, first dust off with a soft brush, wash with castile soap suds, using a soft brush, after which wash with plenty of clear water, to remove all traces of soap. A wad of cotton wool is good for this purpose. Now let the work dry, then if the lustre of the gilt letters need restoring wash off with dilute muriatic acid.

CLEANING A SHOW WINDOW GLASS.—Moisten some pure calcined magnesia with pure benzine, making it into a pasty-like mass. Place a little of this on a wad of raw cotton, with which rub the glass, after which wipe the glass dry, and polish with a cloth. When not in use place the magnesia putty in a tightly stoppered vessel. Be careful not to use near an open flame or fire, on account of the benzine in the mixture.

REMOVING TEMPORARY SIGNS FROM GLASS.—When temporary or advertising signs have been attached to the show window, either by strips or as a whole, it is not the duty usually of the sign painter to remove them, but in case he has to, say in order to do a sign on the glass, then it is well to know how to go about it. Dampening with warm water will soak the paper loose; then clean and polish the glass in the usual way. If the sign painter will remember to use thin paste when attaching such signs it will make the removal much easier for whoever has to do it, besides making it cost the customer less for the work. Use the paste thin, and as little as will do the work. If water colors have been used in doing the temporary sign, then use as little

gum Arabic as possible. Soak the gum in water until dissolved, then mix the color in it thick, to a paste, then thin out with clear water. If you use gold size color, then use as little size as will serve to bind the color, so that it may be removed easily with benzine. The water color may easily be removed with warm water.

CLEANING BRASS SIGN PLATES.—An acid is useful for this purpose, oxalic acid being perhaps the best, but whatever acid may be employed it must be cleaned off afterwards with water, then when dry rub with sweet oil and tripoli powder, which will preserve the brass from tarnishing for quite a long time. Soft soap and rottenstone are also good cleansers, as also a paste made from oxalic acid and whiting. This latter is to be applied wet, then let it dry, finally rubbing with a brush.

REMOVING OLD SMALTS FROM A SIGN.—Dampen the old sand with alcohol, which will loosen it, after which it may be scraped away. Paint and varnish remover will also loosen the sand. If the sign is very old and weather-beaten the sand may often be removed by scraping with an old plane bit, or other suitable scraping tool. Alkali will soften the paint, but is not to be recommended, owing to liability of getting into the wood, which might injure subsequent paint. The blow-torch will soften up the paint, which may then be scraped off.

CLEANING PAINT CUPS AND BUCKETS.—Place a suitable quantity of raw linseed oil in a can of sufficient size and heat the oil until quite hot, but not up to the boiling point, then place the dirty cups or cans in the oil and allow them to remain until the paint is softened, which will be only a few minutes, as a rule. In this way the oil can be strained and used in paint, none the worse for having cleaned the tins.

CLEANING TARNISHED ZINC SIGN.—To clean and renovate a tarnished zinc sign plate place one part of muriatic or hydrochloric acid in twelve parts of water, and with this rub the plate well, using a soft rag; after which wash off with clear water.

BRIGHTENING OLD SMALTS SIGN.—In course of time the smalted ground will become dingy with dust, smoke, etc., and when it is desired to renovate it try washing with benzine. First remove loose dust or dirt with a duster, and some advise washing with warm water, to which has been added a little soap, but care must be taken not to have the suds strong enough to injure the paint. Turpentine is better than benzine for brightening up the smalts, but costlier. The gilt letters may be restored by washing with a dilute acid, using a soft brush.

CHAPTER XLII.

What to Charge for Sign Painting.



IN the absence of a standard price it is obviously impossible to give a list in this connection that will have any great value to the operating sign painter, who already has his own fixed schedule of prices, or to the beginner on his own account, for prices vary greatly with locality, and also with certain conditions of trade, such as location, whether among the large commercial firms or in a small business part of the town or city. Then there is a difference of quality in sign work, or cheap, medium and first-class work. The following lists are in use with some sign painters, east and west, and will serve as a basis, at least. The sign painter will gauge his prices according to those prevailing in his locality, or that will meet the prices of competitors, for be his own ideas what they may, he will have to cut close along the lines established by those around him and who seek work in the same field. As for basing a price upon actual values, it is well to take account of what material and time costs, then add 25 per cent. for profit. This is the method employed by some of the biggest firms, and it is a common-sense business way, too. It is far better than merely working on a more or less arbitrary scale of prices, which may not even approximate cost and profit. Ascertain just what the work costs, add the 25 per cent. for profit, and you will not go wrong, either as regards yourself or your customer.

The cost of materials is a fixed quantity; you know what lumber, paint, etc., cost, but you cannot tell how

long it will take to do the job, that is, not absolutely. What one man may do in two hours another may require two and one-half hours, or even three hours. A fast workman will, of course, get out more work in a day than a slow workman. You simply have to make an average estimate. If you have several hands employed, each one can have a time sheet, and hand it in, with all needful data, showing what job he worked on, and what he used on it, also what time he spent on it. The printers do this, they have the system down very fine. If you are the sole workman, and are very slow, it will not do to charge for time in full as an average good speed workman would be entitled to. You would have to allow for this factor. I have known a sign painter to spend a day on a job that a fast man would have done in much less than five hours. Here the value of some sort of scale of prices comes in good; adopting one that is in use in an average good and large shop, you will be able to get your prices about right, no matter how slow or how fast you may be. Here are some schedules that will prove useful in the manner suggested:

BOARD SIGNS.

Calculated on three good coats of pure lead in oil paint, properly applied, the lettering on this. The board, if you furnish it, the irons, and the putting up all extra. If shaded, in one color, add 25 per cent. extra:

White ground and black letters, lettering per foot	\$.50
Gold, silver, or aluminum leaf, per foot.....	1.00
Ordinary "For Rent" signs, each.....	1.00

WALL SIGNS.

Calculated on two coats of paint and lettering; extra coat of paint one cent per square foot extra. The price

will run from 10 to 20 cents per square foot of surface, depending on size, which may be that of the entire side of a building, to a sign 2 x 4 feet.

GLASS SIGN.

Lettering in gold, silver or aluminum, up to 6 inches in height, per running foot.....	\$.75
Lettering 6 to 10 inches high, per foot.....	1.00
Lettering 10 to 14 inches high, per foot.....	1.50
If shaded, add 25 per cent. for one color.	

Silver and aluminum leaf being very much cheaper than gold, you can charge 25 cents a foot less. A sign painter says that silver lettering by water size (on glass) is worth the same as leafing with gold, deducting the difference in the cost of the two only. He adds that gold lettering is worth from 10 cents to one dollar or more a letter, according to amount of lettering and size, etc. Another one says: "Some figure by the running foot, but many people think that looks very big, and won't pay it. Charge him 8 cents an upright inch, and you won't lose any money. Some sign painters may think this is down too fine, but it can be done for that."

OIL CLOTH SIGNS.

Per foot, up to one foot.....	\$.20
Per foot, up to two feet.....	.25
Two or three feet.....	.30

With these prices you are to furnish the oilcloth, without charge, but frames will be extra.

MUSLIN SIGNS.

Up to one foot in height, black letters, per foot..	\$.08
One to two feet.....	.10
Two to three feet.....	.12

Colored letters 50 per cent. extra. You are to furnish the muslin, but the frames will be charged extra.

JAPANNED TIN SIGNS.

As in prices on all sign work, it is simply a local proposition, what to charge for japanned tin signs. The following table is taken from a price list established by an association of painters in an eastern city, several years ago, but it will serve as a guide for any locality or local condition. As almost every article of barter and workmanship has changed since this price list was set, its prices may be low, but they were high for many places, when set.

SIZE OF SIGN	GOLD	PAINT
3 x 14 inches.....	\$1.25	\$.75
6 x 8 " 	1.50	.75
8 x 10 " 	1.75	1.00
10 x 14 " 	2.50	1.50
11 x 17 " 	3.00	2.00
11 x 17 " with three lines...	3.50	2.50
14 x 20 " 	4.00	2.50
14 x 20 " with three lines...	4.50	3.00
18 x 24 " 	6.00	3.50
18 x 24 " with three lines...	7.00	4.00

If frames are provided, charge extra.

Mr. Frank H. Atkinson, head designer for one of the big Chicago sign advertising firms, and author of a great work on the art, published in 1909, gives a very good approximate list of sign prices, which I have taken the liberty of quoting in this connection. Mr. Atkinson declares that "The minimum of profit for a day's work in sign painting, when in business for yourself, must be \$10 after cost of materials and incidentals has been deducted." We infer that this is to

be the least profit for one man. Doubtless it might be done in some one-man shops, but very few could do so well, though many would like to do it. It could be better done in a large shop, with a large and high-grade line of trade.

DRUM SIGNS.

	GOLD		PAINT	
	<i>Single</i>	<i>Pairs</i>	<i>Single</i>	<i>Pairs</i>
8 inch.	\$2.25	\$4.00	\$1.05	\$2.50
12 "	3.00	5.00	2.25	3.75
18 "	3.75	7.00	2.75	5.00
24 "	4.00	7.50	3.00	5.75
30 "	4.75	9.00	3.75	6.50
36 "	5.50	10.00	4.25	8.00
42 "	6.50	11.75	5.50	10.00
48 "	7.50	14.00	6.50	11.75
5 feet	8.50	16.00	7.00	13.50
6 "	10.00		8.50	
7 "	13.00		9.50	
8 "	15.00		10.75	
9 "	18.00		13.00	
10 "	24.00		16.00	

For lots of six or more deduct 30 per cent.

In flat zinc, deduct 10 per cent.

If lettered entirely in silver, deduct 15 per cent.

For every six inches over three feet in width add 30 per cent.

On re-paint, deduct 15 per cent.

For gold ground add 75 per cent.

For silver ground add 30 per cent.

Varnished ground, add 15 per cent.

Bracket signs, double face, estimate the same as one pair of drums, less 15 per cent.

BOARD AND GALVANIZED FASCIA SIGNS.

				PER LINEAL FOOT		
				GOLD	SILVER	PAINT
Up to 6 inches wide.....				\$.50	\$.40	.30
" 12 " "65	.50	.40
" 18 " "85	.75	.60
" 24 " "				1.00	.85	.70
" 30 " "				1.25	1.00	.80
" 36 " "				1.50	1.25	.90

The above prices are based on smalted ground and one-line lettering.

After the first full line add 30 per cent. per foot for all additional work in gold; silver, add 25 per cent.; paint, add 20 per cent. per foot.

For re-paints, deduct 20 per cent.

If customer furnishes board, deduct 20 per cent.

If finished in varnish, add 30 per cent.

If gold ground, add 75 per cent.

If both sides, add 75 per cent.

CARVED RAISED LETTERS ON FASCIA BOARD, BLACK
SMALT GROUND.

				PER LINEAL FT.
3-inch letter, up to 14 inches wide.....				\$1.25
4- " " 14 to 18 "				1.50
5- " " 18 to 24 "				1.75
6- " " 24 to 30 "				2.00
9- " " 30 to 36 "				2.50

Letters gilded in XX gold leaf, deep shade.

If in silver, deduct 20 per cent.

If two lines of letters, add 75 per cent.

GILDING ON GLASS.

Five inches high, one shade, or lined, 75c. per lineal foot.

If done on ground floor, increase by 20 per cent.
Four-inch or less outline, or with ground, \$1.00 per lineal foot.

Six-inch high, shade or line, 80c. per lineal foot.

From 6 to 8 inches high, shaded or lined, \$1.90 per lineal foot.

From 8 to 10 inches high, one shade or line, \$2.00 and up per lineal foot.

Gold or silver lines around panels, $\frac{3}{8}$ inch or more wide, 10 cents per foot.

For each additional shade, add 20 per cent.

For blended shade, add 40 per cent.

For ornamental face, add 30 per cent.

A sketch should be made for each order, to help in making a correct estimate; draw to a scale of one-quarter inch to foot.

OFFICE DOORS.

Black, colors, or aluminum, per lineal foot.....	.25
Single line.....	.75
Gold numbers on transoms in office buildings, up to five inches high, each.....	.25
Each numeral up to 99.....	.25
Each numeral after 99.....	.20
Colored numerals one-half above prices.	

HOUSE NUMBERS ON TRANSOMS.

	SILVER OR GOLD	PAINT
Up to eight inches high.....	\$2.50	\$1.50
If done in the shop.....	2.00	1.00
Three to five numbers, one trip....	1.80	.80
Five or more numbers, one trip....	1.70	.60

PAINTING CANVAS SIGNS ON FRAMES.

Three feet wide or less, 60c. per lineal foot, up to 25 lineal feet. After first 25 feet, 18 cents per foot.

If wider than 3 feet, estimate at 20c. per square foot, up to 75 square feet; after first 75 square feet charge 15c. per square foot.

If gold lettering, charge 10 per cent. less than for board or metal signs.

UNMOUNTED MUSLIN SIGNS.

Ordinary, per square yard..... .45
 Fifty or more yards, per square yard..... .40
 100 or more yards, per square yard..... .37 $\frac{1}{2}$
 For muslin sign mounted, add 10c. per lineal foot to above prices.

Muslin banners for railway cars, per sq. yard.... .45
 Add \$1.50 a banner for sewing and rope.

UNMOUNTED OIL CLOTH SIGNS.

Ordinary, per square foot..... .15
 40 or more square feet..... .12
 75 or more square feet..... .11

PLAIN SWING SIGNS—TIN OR ZINC.

	GOLD	PAINT
6 x 12 inches.....	\$2.00	\$1.50
10 x 14 ".....	3.00	2.00
12 x 18 ".....	3.25	2.25
14 x 20 ".....	3.50	2.75
18 x 24 ".....	4.50	3.00
24 x 30 ".....	7.00	5.00
24 x 36 ".....	8.50	5.75

For japanned tin, add 20 per cent. If on board, add 15 per cent. If fancy shape, add 40 per cent. If only on one side, deduct one-third.

GLASS SWING SIGNS—IN FANCY FRAMES.

\$3.11 per square foot, glass measure, up to \$5.00 per square foot.

INTERIOR GLASS PANELS, FASCIA.

\$3.00 per square foot.

GLASS SWING HALL SIGNS, ONE SIDE.

On frosted glass, lettered in black or colors, same as swing signs in color letter.

TIN STAIR STRIPS.

In gold or silver, 50c. per lineal foot.

In two colors, 30c. per lineal foot.

PAINTING WALL SIGNS.

Estimated on broke-on or cut-in work, with letter on black ground.

Up to 100 square feet, per square foot05

Up to 500 square feet, per square foot04 $\frac{1}{2}$

Up to 1000 square feet, per square foot04

Above 1000 square feet, per square foot03 $\frac{1}{2}$

Contract of 10,000 square feet or more, per square foot03

If colored ground, 5c. per sq. ft. under 1000 sq. ft.

Above 1000 square feet, per square foot04

Lettered on light-colored ground, under 1000 square feet07 $\frac{1}{2}$

Pictorial work on walls, bulletins and fences, per square foot12

REAL ESTATE BOARDS.

2 x 3 feet, in lots of 25 or less, each \$1.00

2 x 3 feet, in lots of 100 or more, each95

All sizes larger than above, per square foot16

In lots of 25, per square foot09

WINDOW SHADES.

Gold, per lineal foot50

Silver, per lineal foot40

Paint, per lineal foot35

If any shading, add 10 per cent.

LETTERING ON SILK OR SATIN.

Gold, per lineal foot.....	\$1.00
Silver, per lineal foot.....	.75
Color or bronze, per lineal foot.....	.50

CAMPAIGN BANNERS.

For street display, style, ribbons and portrait panels of canvas sewed on net, 14 x 30 feet, \$1.50 each. Or, charge about 30 cents per square foot

PITTSBURGH ASSOCIATION PRICES.

The following schedule is from a price list issued by the Pittsburgh, Pa., Association of Master Painters some years ago. It provides for two coats of paint and the lettering, with an extra charge of one cent per foot square for additional coat of paint:

2 x 16 ft.....	\$6.00	10 x 20 ft.....	\$16.00
2 x 20 ft.....	7.00	10 x 24 ft.....	19.00
2 x 24 ft.....	8.00	10 x 30 ft.....	22.00
2 x 30 ft.....	10.00	12 x 16 ft.....	14.00
3 x 16 ft.....	8.00	12 x 20 ft.....	18.00
3 x 20 ft.....	10.00	12 x 24 ft.....	20.00
3 x 24 ft.....	12.00	12 x 30 ft.....	25.00
3 x 30 ft.....	14.00	14 x 20 ft.....	20.00
4 x 16 ft.....	9.00	14 x 24 ft.....	24.00
4 x 20 ft.....	12.00	14 x 30 ft.....	28.00
4 x 24 ft.....	13.00	16 x 24 ft.....	26.00
4 x 30 ft.....	15.00	16 x 30 ft.....	30.00
6 x 16 ft.....	12.00	20 x 24 ft.....	30.00
6 x 20 ft.....	14.00	20 x 30 ft.....	35.00
6 x 24 ft.....	16.00	20 x 40 ft.....	40.00
6 x 30 ft.....	18.00	21 x 30 ft.....	37.00
8 x 16 ft.....	14.00	24 x 36 ft.....	42.00
8 x 20 ft.....	16.00	24 x 40 ft.....	48.00
8 x 24 ft.....	18.00	30 x 40 ft.....	60.00
8 x 30 ft.....	20.00	30 x 50 ft.....	70.00

10 x 12 ft.....	10.00	30 x 60 ft.....	80.00
10 x 16 ft.....	13.00		

This list gives no discount for contracts, which would of course have to be considered.

BOARD SIGNS—PITTSBURGH PRICE LIST.

Three coats of good paint and lettering. Board, irons and putting up, extra. Shading, one color, 25 per cent. extra.

	PLAIN	GOLD
6 in. x 4 ft.....	\$2.50	\$4.00
8 in. x 6 ft.....	3.50	5.00
10 in. x 8 ft.....	4.00	6.00
12 in. x 12 ft.....	5.00	7.50
11 in. x 15 ft.....	5.00	8.50
14 in. x 16 ft.....	5.00	8.50
14 in. x 18 ft.....	6.00	9.00
14 in. x 20 ft.....	6.00	9.50
16 in. x 16 ft.....	6.00	9.50
16 in. x 18 ft.....	6.00	10.00
18 in. x 18 ft.....	6.00	10.00
18 in. x 20 ft.....	7.00	12.00
18 in. x 24 ft.....	7.00	15.00
18 in. x 30 ft.....	8.00	18.00

PRICES ON WAGON LETTERING.

The following may be considered as an average price list for cities and large towns, east and west.

Plain letters, one color, per running foot..	15c to 20c
Same, with shade.....	20c to 25c
Shaded and ornamented.....	35c to 40c
Plain gold letters.....	45c to 50c
Same, shaded	60c to 70c
Ornamental gold lettering.....	75c to \$1.00

CHAPTER XLIII.

Shop Equipment.



TOOLS REQUIRED IN SIGN PAINTING.—A shop equipment consists of the necessary appliances for doing the sign painting, and sign hanging as well. Hence there will be needed block and tackle, ladders, swings, etc. Easels of different sizes, to accommodate the large and small signs; saws, hammers, nails and screws, torches for paint burning, half-barrel for lye, paint scrapers and putty knives, straight edges and T-squares, steel square, dividers, large and small, chalk line, two-foot-and-longer rules; canvas for smalting, etc. Then there will be needed all the different colors, in oil and japan, in cans and tubes. White lead in large kegs; oil and turpentine; dry colors, such as lamp black and vermilion, etc.; smalts, blue and black; white chalk crayons, charcoal sticks, water colors, artists' moist tube colors, pan colors in water, drawing paper, stencil paper, etc.

This is by no means an exhaustive list, but merely indicates the stock required in a general sign painting shop. The brushes required are as follows:

Camel's hair lettering pencils, all sizes, for oil colors.

Black sable lettering pencils, in quills, Nos. 8, 10 and 12 are most used, but it is well to have all sizes on hand. No. 12 is a special size, used mainly for cutting in on fascia boards.

Red sable lettering brushes, in quills, all different sizes, used in general lettering, and considered the most convenient by experts, as they carry heavy color

well, and their spring is not affected thereby. A very desirable pencil.

Flat camel's hair lacquering brush, for large lettering on oil cloth, muslin and smooth board surface; assorted sizes.

Flat red sable lettering brushes for oil cloth, muslin and fairly smooth surfaces; useful for water color also. A very good brush for free-hand and single-stroke work.

Artists' flat bristle brushes, chiseled, used mainly for pictorial work, etc., on bulletin and wall work.

Flat bristle varnish brush, chiseled, sizes $1\frac{1}{2}$ to 2 inch. Used for coating small boards and board work in general, and for cutting in on wall and bulletin work.

Flat bear's hair, or fitch hair, brush, useful for large lettering on brick wall work, large muslin jobs, canvas and large bulletin work. Assorted sizes.

PRICES OF THE BRUSHES.—Prices vary according to locality and quantity bought at one time. The following are retail prices taken from a large catalogue:

Camel's hair letterers, quills, sizes 1 to 8, assorted, length of hair 1 and $1\frac{1}{4}$ in., per dozen.	\$ 35
Camel's hair swan quill lettering pencils, $1\frac{1}{4}$ in., different sizes, each	07
Black sable lettering pencils, hair $1\frac{1}{4}$ in., sizes 1 to 8, assorted, per dozen	3 00
Red sable lettering brushes, hair $1\frac{1}{4}$ in., sizes 1 to 8, assorted, per dozen	2 00
Camel's hair lacquering brushes, sizes from $\frac{3}{8}$ to 1 inch, five sizes, assorted, per dozen	1 10
Flat red sable lettering brush, single-stroke, assorted, $\frac{1}{4}$ to $1\frac{1}{4}$ in., per set of seven sizes	4 50
Artists' flat bristle brush, chiseled, Nos. 1 to 12, best, range in price each from 8c. to 20c., as to size.	

Flat bristle varnish brush, chiseled, $1\frac{1}{2}$ and 2 in.,
 best grade bristles, 21c. and 40c., respectively.
 Flat fitch brush, or sign painters' fitch, $\frac{1}{4}$ to $1\frac{1}{4}$
 in., assorted, 9 brushes, per set. I 75

There are other kinds of sign painting pencils and brushes, different catalogues carrying varying kinds, but those given in above list are advised by a leading sign painter. And there will be required, of course, the ordinary house painters' brushes, such as the round and flat paint brush, sash tools, fitches, etc.

CARE OF BRUSHES.—Brushes used in sign painting are made to be used in water or oil color, and they should not be used excepting in the medium intended; for instance, the brush made to use in water must never be used in oil or japan color.

When done using a water color brush, wash out in clear water, and rinse until clean. Red sable riggers and flats are used in water color work.

Lettering pencils and brushes used in oil or japan color must be washed in benzine and greased with cosmoline or lard oil, and the hair should be smoothed out evenly, and lay the tool flat in a tray.

Bristle fitches and flat bristle brushes wrap separately in paper, with a ribbon of paper, wrapping tightly towards the ends of bristles, and bending the paper over a little beyond the ends of bristles, to preserve shape of same, and then stand in a cup of turpentine. Thus the tool will be kept from resting on ends of bristles, and its shape will be preserved. You want to keep the point of the brush in shape.

Paint brushes should be wrapped in same way, and not placed in water, but in a trough of turpentine.

Dirty pencils may be cleaned by washing in chloroform and rinsing out in turpentine; then grease and lay away.

Dirty bristle brushes may be cleaned in fusil oil, or paint and varnish remover, letting it soak in same until the old paint softens, then scrape off and rinse in turpentine.

If a lettering pencil falls to the dirty floor, clean off by holding it over a pot and pour turpentine or benzine over it, which will wash off any adhering dirt.

If a pencil gets bent, the hairs becoming kinked by laying crooked in box, let it soak in turpentine until the hair softens, then run it under the finger, on a warm iron. This will straighten out the kink, and then the tool may be greased and laid away.

SHOP EQUIPMENT.—The equipment of a sign painting shop will depend upon extent of business done and character of same, as far as quantities go, but any shop will need trestles, or what carpenters call horses, which should be about 28 inches high. Two at least will be required, and as many more as business may call for. Ordinary small sign work is done on small easel, of which one at least will be needed, and for larger work one double easel will be required. These are 7 feet long by 5 feet high, made from 2 x 4 scantling. In the uprights bore hole for pegs 5 inches apart. Stilts also will be required where large work is done. A stilt is a piece of scantling 2 x 4 and in length a little more than height of shop ceiling; along the ceiling is fastened a strip of wood notched at intervals of six feet or so, each notch four inches wide; in the notches are placed the stilts. The stilt is also useful for standing against the wall, to hold sign. For this purpose you may have lengths varying from 6 to 12 feet, which will accommodate the various sizes of boards. Thus, the shortest stilts will hold a sign, the next in size another, and so on until you will have several signs thus held securely out of the way.

There will be needed ladders, ropes and swings, etc., nails, screws, hammers, saws, etc. All for hanging signs, etc.

A paint bench of circular form is advised by Atkinson, and has a post in middle supporting shelves above and below the table; to the post above table fasten paint presses, the shelf above having hole in it for the press rod to run through.

The top of table cover with zinc, which is easily kept clean, and color may be ground under the palette knife on it. Top of table may be about 40 inches above floor, and its diameter may be 40 inches. shelves under table the same diameter. Place ball-bearing castors on the feet of table.

Small paint stands are also needed. These for use when working at an easel, etc.

If you intend doing show card work you will need a bench for that. This may be a table top three feet wide by five feet long, hinged to the wall or to the sill of a window. This can have a leg support, with a notched strip on floor in which to place the leg at any desired angle for work.

Then there must be a muslin-board $6\frac{1}{2}$ feet wide by 25 feet long, this to be placed in ways slanting from the ceiling outward, so that paint from your brush will not drop on to the muslin below. Fasten the muslin to the board with steel clips. The board works up and down in the ways. An upright reel at the left of the muslin board will hold the roll of muslin.

A handy rack for holding a stock of raised letters may be made by making an upright frame 6 x 10 feet from 2 x 6 plank, with cross pieces at bottom to form the base. For holding the letters string copper wires across instead of wooden shelves, two wires to a shelf. five inches apart, and shelves four inches apart,

A smalt cloth should be provided, made from 4-ounce duck, about 40 inches wide, and up to 60 feet in length, according to requirements of shop.

TO MAKE A SIGN PAINTER'S STRAIGHT-EDGE.—To make a sign writer's straight-edge, dress a lath true and thin. Make a handhold out of a piece of board $\frac{1}{2}$ or $\frac{3}{8}$ inches thick and about six inches long. Get the exact center of the lath, and of the handhold, and drive a nail so that it will go in the centers of both, fastening the handhold to the lath; now bend the lath to form a slight bow, then drive two nails into the handhold, one at each end of it; the slight bow in the straight-edge is flattened out when you hold the straight-edge on to the work, so that it is not as likely to slip under the hand when drawing a pencil or crayon along it as it would were it made perfectly flat. The handhold is handy for holding the straight-edge down with.

HANDY BRUSH PALETTE.—Atkinson says, take empty gold leaf book and fasten its first leaf against the top of the color stand, in the shop, and let the other leaves hang over the edge of the table. The first leaf may be attached to table with a few drops of color. As fast as a leaf is filled with color turn it over on to the first leaf, and so on until all the leaves have been used.

USING THE CHALK LINE.—A handy chalk line for banner or muslin work may be made by attaching a fish hook, with the barb filed off, to the end of the line, and the hook may readily be inserted and removed by one man. For some work the brad awl is useful, and in most work it takes two men to handle the chalk line.

MATERIALS AND TOOLS, AND COST.—The following is not a full or complete list, but serves as a useful reference for most of the materials and tools not

mentioned in any of the foregoing lists. Prices given are approximate, though taken from a current price-list:

Copper foil, silver or white, $4\frac{1}{2} \times 10$, per sheet, 5c.; crimson, scarlet, blue, green, gold, etc., 6c.

Tin foil, thick, per pound, 30c.; medium, 40c.; thin, 45c.

Pearl, in sheets, Aurora, selected pieces, per ounce, 50c.; small pieces, 25c.; crushed, 5c.

Frosting and diamond dust, white, in boxes, per box, 10c.; per pound, 40c.; best French, per pound, \$2.50.

Gold leaf, lemon, XX, per book, 50c.; pale, XX, 50c.; usual, 45c.

Silver leaf, $3\frac{3}{4} \times 3\frac{3}{4}$ -in., per book, 15c.

Aluminum leaf, book of 50 leaves, $5\frac{1}{2} \times 5\frac{1}{2}$ -in., 15c.

Dutch metal, several qualities at various prices, but N. G.

Florence leaf, about same as related of Dutch metal.

Bronze powders, several colors and qualities in 1-ounce papers—antique green, brown, carmine, crimson, copper, dark green, fawn, fire, flesh, green gold, lemon gold, maroon, orange gold, pale gold, rich gold, silver, steel blue, vermilion.

No. 500 pale gold bronze powder, for common work, per pound, \$1.00; No. 1000, rich and pale gold, only, per ounce, 10c.; No. 2000, ditto, per ounce, 12c.; No. 3000, rich and pale gold and silver, per ounce, 15c.; No. 4000, rich and pale gold, silver, and all other colors, per ounce, 18c.; No. 6000, ditto, 20c.; No. 8000, ditto, 25c.; No. 10,000, rich and pale gold, per ounce, 40c.

French leaf, pale and gold, 35c.

Lining, No. 1, 35c.; extra fine, 50c.

Flitters, or leaf brocades, rich, pale and green gold, per ounce, 10c.; silver, 12c.; colors, 10c.

Metallics, or genuine brocades, gold, 10c.; silver, 15c.; copper, 12c.; dark green, fire, fuchia, light blue, dark blue, lilac, orange, peacock blue, lemon, carmine, 18c.

Patent bronze powders, in many colors, per ounce, 25c.; per pound, \$2.25.

Aluminum bronze, genuine, per ounce, 25c.; per pound, \$2.25.

Gold size, burnish, in 1-pound cans, 65c.; oil ditto, 65c.; quick drying, per pint, 65c.; japan, in half-pint cans, 35c.; pint cans, 65c.; quart cans, \$1.20.

Gilders' knives, No. 4, single edge, 6-inch blade, 50c.; No. 5, double edge, 6-inch blade, 75c.

Gilders' cushions, No. 1, plain, medium, 5x8, 85c.; No. 2, plain, large, 6x9½, \$1.00; No. 3, fine, large, 6x9½, \$1.25.

Gilders' tips, 4-in. camel's hair, 1½ to 3 inches, counting length of hair, 15c.; tip handles, 5c.

Gilders' brushes, camel's hair, in split quills, 12c. to \$1.30 each, according to size. These brushes are bound with goose quills, which are split and bound around the hair; thus, a brush that one such quill will cover is called one quill, the price being say 12c. and so on up. The ends of the hair are cut off square or made into a round form.

CHAPTER XLIV.

Office and Shop Stationery.



S in any business, the sign painter should be provided with the proper stationery, but particularly should he use only the best of printed matter, good linen paper mainly, at least for his correspondence, and so give evidence of an artistic temperament. Such commonplace as "Do you believe in signs? We make 'em," should be tabooed, as coarse and common. Make your letter heads and other printed matter read in a good business form, giving location in full, as well as firm or individual name, avoiding two or more colors, getting the printing done by the very best printers, and in all ways seeking fine business effects. It counts with people whose custom it is desirable to get and to hold. I have seen all sorts of letter heads gotten out by sign painters, and usually they are open to criticism. For instance, here is one with the painter's picture, not of his face, which might have been comely enough, but of the back of his head. Another is printed on a vile smelling orange-yellow paper; all these yellow papers smell rank.

It would be better to use plain linen writing paper, of medium weight, and such paper, with the best of printing, may be had for about \$3.50 per one thousand sheets, with envelopes to match at about a dollar less than the letter heads. And if possible, and of course it is possible, have a typewriting machine, which you can soon learn to use, making a neat and business-like letter. Moreover, the machine will make figures perfectly, which the pen may not, and

often does not do. I saw in one shop an adding machine. This might be dispensed with, but the writing machine is needed:

Different forms obtain among sign painters for sign specifications, but here is a very good one, used in a North Carolina shop:

SPECIFICATIONS FOR SIGN.

Wilmington, N. C. 190....

Name

Address

Sign to read

Double or Single Face

Length of Sign Width

Vertical or Horizontal

Letters Size Color

Background preferred

Material

To be delivered

Remarks

.....

.....

Signed

PLEASE OUTLINE SKETCH ON OPPOSITE SIDE

CHAPTER XLV.

Silvering and Re-silvering Mirrors.



IT would appear, from the number of inquiries received, that sign painters have silvering to do at times, and as the process is not generally known, and not easy to get, though some enterprising individuals advertise to teach "the art of silvering mirrors, whereby big money can be made," and for the nominal sum usually of two or three dollars, I have thought it well to give here some account of the best methods for doing this particular work.

The utmost cleanliness must be observed in this work. Not only the glass, but everything in and around the room where the silvering is done must be clean and free from dust or dirt of any kind. The glass used must be bought for the purpose; ask the glass man for silvering quality. Even good ordinary plate glass will not do. And marvel not if your work should be a failure at first, for it is like other things, requires practice to do good work. Remember that, and do not find fault with the method chosen or employed. Be careful not to scratch the glass, as every such imperfection will show up in the silvering.

There are two ways of applying the silvering, as you will see by reference to the formulas; one way is to lay the glass face down in the pan of silvering; the other way is to pour the solution over the face of the glass; by the well-known law of capillary attraction the fluid is kept from running over the edges

of the glass, even when quite above the edges. But if the glass is rough or cracked or ragged around the edges the solution will run off; prevent this by placing a little wax around the edge. Paraffine wax will do. A second silvering applied while the glass is still damp from the first application will give a better job than one silvering will. The backing up may be shellac varnish, over which apply a coat of japan black thinned with turpentine, or a coating of asphaltum varnish. Some cheap glass mirrors are coated over with red lead paint only. Have plenty of daylight for the work.

Mirror-background signs may be backed up with asphaltum varnish, and when this is dry, allowing it at least 24 hours to dry in, the parts that are not protected and which are to be removed, may be taken away with dilute nitric acid.

Convex, curved, concave and chipped glass may be silvered, but will require more silver solution to the square foot than plain glass. Druggists' globes, etc., may also be silvered. Lead and mercury amalgam used to be the silvering material, with tin added, but owing to the poisonous character of the substances it has been discarded.

SILVERING PLATE GLASS.—In the first place, a clean room and clean glass, and in brief, clean everything connected with the work, is essential. Have a solid table in the center of the room, four feet high, and 8 x 6 feet. This table must be lined with steam pipes, so that the temperature of the bed of table can be kept at from 80 to 100 deg. Fahr. Clean the glass with dilute nitric acid, or with strong sal-soda water, cleaning after this with a cloth wet with alcohol, then polish with tissue paper. The glass must be absolutely clean. And the glass must be specially made or selected for the purpose.

The silvering formulas are numerous; here is one given by a workman of Chicago, who is endorsed by a painter as being "the best workman at the business I ever saw."

No. 1 SOLUTION.—Take 80 grains of silver nitrate and dissolve it in 10 ounces of preferably distilled water. To this add 2 ounces of alcohol and 2 ounces of ammonia water. Add the ammonia drop by drop, until the precipitate first formed is all dissolved. This should stand three or four hours before it is ready for use.

No. 2 SOLUTION.—Then take 6 ounces of water and dissolve in it 24 grammes of silver nitrate, and add to the same 30 grammes arsenate of copper. Then add liquid ammonia drop by drop, same as directed in first solution, until dissolved. To this add 2 ounces of alcohol.

Now make a separate solution of 48 grammes of potassa in 16 ounces of water. Bring this to the boiling point in a suitable dish. Add to this solution, while it is hot, the second mixture (Solution No. 2), drop by drop, and continue boiling for about one hour, then allow it to cool. Then filter it, and it is ready to use.

Place the glass on the table, and make it perfectly level. Take some filtered water, a small quantity, and add to it equal parts of solutions No. 1 and 2. Mix thoroughly. Pour the mixture over the glass as quickly and evenly as possible, and let it stand 10 to 15 minutes. If, upon examination, the silvering is not brilliant enough, give it another coat of the mixture, while the first is still damp.

After the silvering is dry it may be backed with a coat of asphaltum varnish, or shellac, after which a coat of red lead paint.

METHOD II.—Make up these two solutions:

No. 1.—Dissolve 80 grains of nitrate of silver in 2 ounces of distilled water.

No. 2.—Dissolve 80 grains of pure caustic potash in 2 ounces of distilled water. Add water of ammonia drop by drop, with continual stirring, to Solution 1, until the whole of the silver is deposited and redissolved. When this has been accomplished the solution will appear quite clear. Then add the potash solution (No. 2), which will cause the first solution to become black. Add more ammonia water, drop by drop, stirring as before. The slower the ammonia is added the finer the division of the silver will be. When the solution again becomes clear the action is complete. A weak solution of nitrate of silver is then added, drop by drop, until a very pale brown color is attained. Errors may be corrected by adding more silver or ammonia as may be necessary. The silver should be slightly in excess in the final solution. *This solution should not be kept, as it becomes a powerful explosive.* Filtering is not recommended.

Take $2\frac{3}{4}$ ounces of the solution and add water to make up 8 ounces. Have a suitable shallow vessel for the bath, placing two small sticks in the bottom for the glass to rest on, then pour on the solution, carefully, to avoid any air bubbles. Let the solution remain on a few minutes. Then the solution is poured off, and added to it is a 10 per cent. reducing solution of grape sugar or sugar of milk. This is then carefully poured back into the bath, over the mirror, avoiding air bubbles. The deposition of silver begins to take place, and the solution becomes muddy. The slower the action takes place the harder the deposit. Leave until all the silver has been deposited, then pour off the solution, and wash off the glass with distilled water several times. Dry carefully, to avoid marking

the mirror, and polish plain face of glass with rouge. It is done.

It should be observed that a drop of sweat on the silver on the glass will cause a spot that will make it necessary to do the work over. The room in which the work is done must be kept at a high temperature, so that there is danger from sweaty fingers. Be careful, therefore, when handling the glass.

For the bath, provide a tin pan of suitable dimensions, make a mixture of rosin and beeswax, equal parts, melt same, and coat the inside of the pan. Place two sticks of $\frac{1}{8}$ -inch thickness across bottom of pan.

DRAPER'S METHOD.—Dissolve 560 grains of Rochelle salts in 3 ounces of water. Dissolve 800 grains of nitrate of silver in 3 ounces of water. Add the silver solution to 1 ounce of strong ammonia until brown oxide of silver remains undissolved. Then add, alternately, ammonia and silver solution carefully until the nitrate of silver is exhausted, when a little of the brown precipitate should remain; filter. Just before using, mix with the Rochelle salt solution, and dilute to 22 ounces.

Clean the mirror with nitric acid or plain collodion and tissue paper. Take the prepared tin pan with sticks in bottom, as directed, and quickly pour in the silvering solution. Put in quickly the glass mirror, face downward, one edge first. Carry the pan to the window and rock it for one-half hour. Bright objects should now be scarcely visible through the film. Take out the mirror; set it on edge on blotting paper to dry. When perfectly dry lay it, face up, on a dusted table. Stuff a piece of softest thin buckskin loosely with raw cotton. Go gently over the whole silver surface with this rubber, in circular strokes. Put some very fine rouge on a piece of buckskin.

laid flat, on the table, and impregnate the rubber with it. The best stroke for polishing is a motion in small circles, at times, going gradually round on the mirror, at times across on the various chords. At the end of an hour of continuous rubbing, with occasional touches on the flat rouged skin, the surface will be polished so as to be perfectly black in opaque positions, and, with moderate care, scratchless.

It is best, before silvering, to warm the bottle of silver solution and the mirror in water heated to 100 deg., Fahr.

PETTIJEAN'S METHOD.—The glass to be silvered is laid upon a horizontal cast iron table heated to 104 deg., Fahr. The surface of the glass is made clean in the usual way, and solutions of silver and tartaric acid, suitably diluted, are poured upon it. The liquid will not flow over the edges of the glass. In 20 minutes the silver begins to be deposited on the glass, and in $1\frac{1}{4}$ hours the process is completed. The liquid is poured off and the glass is washed in distilled water, dried, and covered with a varnish to protect it. But the silvering is likely to yellow, and another man invented a method for overcoming this fault. The glass, after it has been washed, as described above, is sprinkled with a dilute solution of the double cyanide of mercury and potassium. The silver displaces a part of the mercury and enters into solution, while the rest of the silver forms an amalgam white and much more adhesive than pure silver. The transformation is instantaneous. The amount of mercury fixed does not exceed 5 to 6 per cent. The glass is freed from the yellowish tint of pure silver. It is also less attacked by sulphur vapors and the rays of the sun. It is superior to any other silvering.

MARTIN'S METHOD.—

A.

Avoirdupois Weight.

Nitrate of silver 175 grns.

Distilled water 10 oz.

B.

Nitrate of ammonia 262 grns.

Distilled water 10 oz.

C.

Caustic potash, pure 1 oz.

Distilled water 10 oz.

D.

Pure sugar candy $\frac{1}{2}$ oz.

Distilled water 5 oz.

Dissolve and add—

Tartaric acid 50 grns.

Boil in the flask for ten minutes, and when cool add—

Alcohol 1 oz.

Distilled water, q. s., to make up to 10 oz.

For use take equal parts of A and B. Mix together also equal parts of C and D, and mix in another measure. Then mix both these measures together in the silvering vessel, and suspend the mirror face down in the solution.

BURTON'S METHOD.—

A.

Nitrate of silver 25 grns.

Distilled water 1 oz.

B.

Pure potash 25 grns.

Distilled water 1 oz.

C.

Solution A 1 part.
 Solution B 1 part.
 Ammonia to just dissolve the precipitate.
 Solution A to just cause a discoloration.

D.

Loaf sugar 2700 grns.
 Distilled water 20 oz.
 Nitric acid 2 drms.
 Alcohol (strong) 10 oz.
 Distilled water to make 80 oz.

For use—

Solution C 1 oz.
 Solution D 1 drin.

Solution C is subject to slow decomposition; solution D, on the contrary, improves by keeping.

A. A. COMMON'S METHOD.—

Solution 1.—Nitrate of silver, 1 oz.; water, 10 oz.
 Solution 2.—Caustic potash, 1 oz.; water, 10 oz.
 Solution 3.—Glucose, $\frac{1}{2}$ oz.; water, 1 oz.

The above quantities are those estimated for 250 square inches of surface. Add ammonia to Solution 1 till the turbidity first produced is just cleared. Now add No. 2 solution and again ammonia to clear; then a little solution, drop by drop, till the appearance is decidedly turbid again. Then add No. 3 solution and apply to the clean glass surface. By this formula a film was produced in 43 minutes at a temperature of 56 deg. Fahr.

RE-SILVERING MIRROR.—First, the old material must be removed, using for this purpose any ordinary paint and varnish remover, and after this is done, clean up with common nitric acid and water, say half-

and half. This may be done with a piece of rag on a stick. Then the glass must be made clean with water and whiting, rubbing and polishing. Maybe it would be well to use pulverized or precipitated chalk instead of whiting, which may have grit enough to scratch the glass. When clean and bright, carefully examine the glass for scratches or other defects, and if any are found call attention of owner to the fact.

Be careful that no acid is left on or around the glass or blocks or table. Tarnished or defaced spots may be removed by gently rubbing with a flat piece of cork and fine chalk powder. Never use a knife or spatula on a glass.

After getting the glass in perfect condition proceed to silver it as directed for new glass.

A writer in "1,000 More Paint Questions Answered," says that the materials for re-silvering will cost about five cents per square foot, and that you ought to charge 50 cents per square foot for re-silvering, and 40 cents for new work, "except in cities where there are mirror factories." The reason is obvious.

If a large part of an old mirror is to be done, better remove it all and do it all new. It will be the cheaper plan, and give a far better job.

REPAIRING A MIRROR.—Remove the silvering from around the damaged parts and make the glass perfectly clean with alcohol and a soft rag. Now take a piece of broken mirror and near the edge of it mark out a piece of silvering a little larger than the part you want to repair, and then place a tiny drop of mercury on the piece of silvering you are to remove to the mirror, and after a few minutes clear away the silvering from around the latter and slide the section of silver on to the part you are to repair. This is not so easily done, however, and it may require some

practicing on another glass before you will be able to repair the mirror successfully.

CLOUDY STAINS ON MIRRORS.—The following from an English contemporary will prove interesting here, and may be of service to some one in a like predicament:

W. H. A. writes: I would feel much obliged if you could answer me the following question: Some time ago we sold a bevel plate mirror to a customer, which seemed to experienced eyes in good order, but after a lapse of two or three months the customer brought it back and pointed out some smoky or brown stains between the silver and the glass, and wished us to replace it with another one. Now, if you could tell me the cause and remedy through your columns, I am sure you will be conferring a great benefit to those of your subscribers who are in business. I have noticed the same thing on a large sheet of mirror that was fixed in a large window and got a good deal of sunlight on it. Was that the cause of the stain? and if so, is there a cure to restore it back to its original condition? The backing of the glass is quite intact, and the glass is in good order, only when looking at it at a certain angle this brown smoky smear in large patches is to be seen. I hope you can throw some light on this matter for me.

The following reply is based on the assumption that the inquirer does his own bevelling and silvering: Stains, varying in color, density, etc., are more often caused by imperfectly swilling off the Perchloride of tin wash, consequently there is more solution of tin on the glass than there should be. Before we could treat the matter thoroughly we should know (1) are you making your own tin solution or whose are you using (Firm.)? (2) Are you sure your distilled water is not contaminated? (3) What are you

precipitating your nitrate of silver with, RS or TA? (4) Are you working with your "table" too hot or by the cold process? (5) What are you backing up the plates with, after silvering? Stains as described are of constant occurrence, and very annoying as well as expensive. And the items we have enumerated are all factors to be reckoned with, when good lasting work is demanded. When the silvering is properly done any amount of sunshine should not affect it, but even then, if the backing is not the correct one to use, there are sure to be stains, and cloudy patches develop. The questions you have asked are of a purely technical nature, and cannot be answered in an offhand, haphazard manner.

TO PREPARE A TRANSPARENT MIRROR.—The following process for producing a mirror which reflects from one side, but is transparent from the other, has been patented in Germany: Dissolve 1 part by weight of silver nitrate in 10 parts by weight of water and label No. 1. Prepare another 10 per cent. solution of silver nitrate, but in larger quantity; to this add ammonia water, drop by drop, stirring carefully until the precipitate formed at first is completely dissolved, and label No. 2. Now add solution No. 1 to solution No. 2 until the odor of ammonia is no longer recognizable and the liquid has again become very turbid. Now add 100 parts by weight of distilled water for every part of silver nitrate originally used in solution No. 2, and filter until clear. Label this No. 3. Prepare a reducing solution by dissolving 0.8 part by weight of Rochelle salt in 384 parts by weight of distilled water, boil, and to the boiling solution add gradually a solution of 3 parts of silver nitrate in 10 parts by weight of distilled water, and filter when cool, and label No. 4. Clean the glass to be coated thoroughly, lay it on a perfectly level surface in a

room at a temperature of about 25 degrees C. (77 deg. F.). Mix equal parts of No. 3 (the depositing fluid) and No. 4 (the reducing fluid) and pour over the glass. The glass may, if preferred, be dipped into the solution. The time required for the deposition of the layer of silver of just the correct thickness has to be determined by the judgment of the operator in each case, and this may be aided somewhat by observing a piece of white paper below the plate of glass. When a sufficient deposit of silver has been made, and much less is required than for an ordinary mirror, pour off the silvering liquid and rinse thoroughly with the distilled water, and stand the mirror on edge to dry; coat the silvered side with a solution of colorless shellac in alcohol and finally frame the mirror with a backing of clear glass to protect the mirror surface from being scratched.

CLEANING A MIRROR.—Mirrors should be washed with cold water, using a chamois leather and soft cloth. They polish more brightly if washing blue is added to the water or, better still, if a little wood ash is tied up in muslin and allowed to dissolve through. The use of a paste of whiting is not to be commended. It certainly produces a good polish, but it is liable to be gritty and produce unsightly scratches on the surface of the glass, and all too frequently it forms an unsightly margin where it works its way under the frame. An old silk handkerchief makes an excellent polisher for mirrors, as does likewise tissue paper of good quality.

HOW PLATE GLASS IS PREPARED FOR SILVERING.—The following description of the modern method of making or preparing plate glass for silvering is taken from the *Furniture Journal*, from an article by George W. Mueller:

The major portion of all plate glass that is used

for mirrors to-day, and for mirrors for the furniture manufacturers in particular, is, of course, produced in the United States. Still enormous quantities are imported into this country annually from France, Belgium, England and Germany for the purpose. The better or selected qualities of plate glass, "silvering qualities," as they are called, are only used. For a time the American manufacturers of plate glass, in their efforts to sell quantity rather than quality, were producing, with few exceptions, an inferior grade of glass, comparatively, than that of the European manufacturers. Now conditions have changed, and the majority of the American manufacturers, having realized the folly of their ways, are making glass that runs away ahead of that of their European cousins in quality.

This plate glass reaches the mirror factory in regularly established sizes. Every furniture factory, as a rule, has individual patterns for mirrors that fit the various "pieces" that they are making, and they supply the mirror maker with paper templets of the exact shapes. The plate glass is cut to these various shapes, and after this is done the glass is ready to be beveled.

The beveling of glass is done by machinery, and each glass must pass over five different machines before the bevel is completed. The first machine that receives it is the roughing mill. This mill consists of a steel disc two inches thick and thirty inches in diameter, set to revolve horizontally. Directly over this revolving disc immense hoppers are suspended containing sand and water, which are automatically fed on to the revolving disc as required. The operator takes the plate of glass to be beveled and holds it on to the revolving disc at the required angle, which is determined by the width of the bevel desired. In

this way the glass is ground in much the same manner as one would grind an ax. The sand and water on the revolving disc then grind away the glass, leaving it very rough, and resembling closely the ground glass one sees in partitions and windows. To smooth down the coarseness the plate is run over the emery mill. The emery mill is identical with the rough mill, but is fed with emery and water instead of sand and water, as on roughing mill. After the glass leaves the emery mill the bevel still looks like ground glass, but the grain is much smoother and finer than after the roughing process.

The next step is the smoothing stone. This is a quarried stone, and all the stones that are used for the purpose in this country are imported from England, as we have yet to find a quarry here yielding a stone free enough from iron spots and of a smooth enough grain and of the proper consistency to be available for the purpose. These stones are turned down until they are four inches thick and about thirty inches in diameter. They are then mounted on machines that revolve horizontally. They must run absolutely true and even and without vibration, otherwise a great deal of breakage would result. The glass is handled on this stone in the same manner as on the roughing mill, and after the smoother has finished with the plate the ground effect on the bevel has disappeared entirely, and instead it has a hazy appearance. It is still in such shape that one cannot look through the beveled part. For smoothing the bevel of plates of intricate pattern a special smoothing stone is used ten inches thick and in the shape of a cone, and is mounted on machines with the point up. This stone is used regularly where the bevel must follow a curve in the pattern. From the smoothing stone the plate is taken to the "white wheel."

The white wheel is a large solid wheel made of specially selected southern white wood, and is set in the machines to revolve vertically. It is three inches thick and from two to three feet in diameter. By means of a mechanical appliance (a part of the machine) the revolving surface is fed at will by the operator with a mixture of ground pumice stone and water. When the white wheeling operation is completed the bevel is clear and transparent, but it still lacks the finishing polish that gives the completed bevel its lustre. For this last polish it is sent to the polishing wheel or buffer.

The polishing machines consist also of wood wheels, three inches thick and twenty-four inches in diameter and revolve vertically like the white wheel. But the outer rim or working edge of this wheel is covered with heavy felt two or three inches thick, and this felt when treated with the polishing rouge does the polishing. The rouge used is a red powder made of various materials especially for the purpose. The result of this operation insures a finishing polish of the highest degree of perfection. This polishing completes the bevel.

HOW THE SILVERING IS DONE.—Mr. Mueller then goes on to describe the silvering process:

When the plate reaches the silverers it is first placed on the washing tables, and carefully and thoroughly washed by hand with water and putty powder and felt hand blocks. It is then thoroughly rinsed with distilled water to remove all impurities, as ordinary water contains too much chemical matter that would injure the silvering. It is then ready for silvering, and while still wet it is placed on the silvering tables. The silvering tables are immense hollow tables with stone or concrete tops and a closed-in steam heating system underneath that thoroughly

heats it. The stone top is covered first with a canvas cover and then with a woolen blanket to help retain the heat and keep it at an even temperature. Onto these tables, then, the glass is laid with the front or face side down, and onto the back or reverse side the silver solution is poured.

The formulas for the silvering solution have always been more or less of a trade secret, but there are so many different formulas in use to-day that really there is no standard. The basic principle of all successful silvering formulas is the dissolving or cutting down of nitrate of silver (which is chemically pure metal silver reduced to crystal form) with ammonia to reduce it to a liquid state and then adding an acid solution of Rochelle salts, or tartaric acid, to precipitate the silver in metal form out of the solution and onto the glass. The solution when ready for use looks very much like water, but the effects of the acid and the heat of the tables, after it has been poured onto the glass, gradually change its color until one can see the metal silver slowly begin to form and spread in the shape of a thin film of metal over the surface of the glass. The fine art in silvering mirrors is in the mixing of the various materials that go into the solution, and the ability of the silverer to judge the chemical action after the silver is on the glass. The working of the solution must be watched with identically the same care that is observed in the developing of a photographic negative, and very many like difficulties have to be overcome in both. A successful silverer is born and not made, and there are but few really successful silverers to-day.

After the solution has been poured onto the glass it requires from one-half to one hour's time for the silver to form in good shape. As soon as this occurs

the plate is taken up and the superfluous solution is allowed to run off. The coating of silver is then carefully wiped dry with chamois skin. The plate must be handled most carefully when in this shape, as the silver is so sensitive that a touch of the finger would leave a mark. The perspiration from the human body is most injurious to the silvering, as it contains so much salt and alkali. As the rooms in which the silvering is done naturally become overheated from the silvering tables the silverers are almost continually perspiring. The slightest drop of the moisture on an unfinished mirror would ruin it, and it naturally follows that the silverers must be most careful on this point.

After the actual silvering is completed the plate must still be treated with a coat of shellac and a coat of paint, as a protection for the silver. For the shellacing the finest grade of orange gum shellac, cut down with alcohol, is used, and this is applied directly over the silver with the finest of camel's hair brushes. When this is dry a coat of paint is applied over the shellac. The paint used is a special one for the purpose, and must be entirely free from oils and acids that would have a detrimental effect on the silver. When painted the mirror is placed in drying rooms until the paint is thoroughly dry. It is then thoroughly cleaned and polished with cloth and dry pumice stone by hand, and is then complete and ready to take its place and to do its duty.

CHAPTER XLVI.

Drilling Holes in Plate Glass.



It is sometimes desirable to bore plate glass, as in hanging window signs, as well as in large plates for various purposes, but mainly for fastening them in windows. Also, it is sometimes necessary to bore a hole in order to repair broken parts. Owing to the fragile nature of glass it is rather difficult to bore into it successfully, yet it is often done by those accustomed to the work, and may be done very well by the amateur if he is careful and understands how to do it.

Turpentine supplied to a small steel drill will enable one to bore through, but it takes lots of time and patience, and the hole is not always just as nice as might be desired. The hole is apt to taper from a large one at the top to a small one at the bottom, and it is difficult to drill two holes of the same size with the one tool. A writer in the *Scientific American* gives the following formula and method as being superior to anything he has ever tried for the purpose. He uses a fluid composed of two fluid ounces of pulverized camphor and six drachms of sulphuric ether, adding enough turpentine to fill a six ounce bottle full. It has been developed after many experiments with different mixtures, and it is claimed for it that it will prove superior to anything heretofore known. With a bastard file wet with it, a piece of plate glass may be put into a vise and filed like wood; any other cut of file may be used, but where there is much glass to remove, the coarser the file the better.

For drilling small holes, a brass tube of the diameter of the hole wanted is better than a drill. The tube should be made smooth on the end that is to come in contact with the glass, and charged with carborundum powder, or what is better, diamond dust. In starting the hole a piece of wood having a hole drilled in it of the size of the brass tube should be cemented to the glass, the hole being located over the spot where the desired hole is to be made. A hole should be made in the side of the tube by filing into it with a round file, and it may be turned either by a drill press, or by one of the small, geared, hand-drill stocks used for small drills. With a small brush dipped in the solution wipe the hole so that a little of the mixture will run down inside the tube, and onto the glass where the hole is being made, and the tube will be found to enter the glass with surprising ease. If it is desired to have the edge of the hole sharp where the tube comes through, cement a small piece of glass to the under side of the plate being bored, and when the tube is through, continue the boring until it has entered the lower plate slightly. Glass cut with the diamond will often break unevenly, and fail to fit a window sash; circles cut out for the dials of instruments of the clock class, circles for static electric machines, glass covers for galvanometers, ammeters, and many other instruments are often thrown away, when a touch with a file wet with this solution would save them. It is especially recommended to glaziers to remove the sharp edges of the glass cut with the diamond, which often cut the hands.

Boring may be done with an ordinary steel drill, but a broach drill is better, and may be used by hand or with a bow. The bow is a very simple and convenient means of rotating a drill. Select a broach

drill of a bore that will make the hole of the right size, at about one inch from the end. It should be broken off sharp with a pair of pliers at about one and a half inches, and when the sharp edges are blunted by drilling, a fresh end should be made by breaking off one-eighth inch, and so on until the hole is bored. Drill from both sides, to insure safety from breakage. Drill very lightly, and lubricate the drill with turpentine, oil of lavender, or a little camphor.

If you wish to remove a large disc from thin glass, making a large hole, press a disc of wet clay upon the glass, making a clean-cut hole through the clay, of the size you wish the hole in the glass to be, and upon the glass thus laid bare within the clay pour molten lead, whereupon lead and glass disc will both drop out. Putty is even better than clay for this purpose, as wet clay is apt to make the hot lead sputter.

Be sure to keep the end of the copper tube drill perfectly flat, or otherwise it will not hold the emery well. The tendency of the drill is to wear round.

Perhaps the best of all methods for drilling glass is that of the diamond drill, because the cutting part, being diamond, needs no re-cutting, as steel and other soft metals do, and is always ready for use. Make the diamond drill as follows: Fit a brass drill to the drill stock, sawed down a little distance with a notched knife to allow a splinter of diamond to fit tight, fixing the splinter in the split wire with hot shellac or sealing wax. Use the drill dry, and handle it with care. Very large holes may be made by drilling small holes close together, in the circle of the size hole required, and then filing away the narrow connecting parts of the small holes.

Procure a case hardened drill, slightly twisted at the point, and with a carpenter's brace, proceed to drill the glass as if boring a hole in a piece of wood,

meanwhile keeping the point of the drill moist with turpentine. Drill the glass half way from each side, in order to prevent chipping around the edges of the hole. For a small hole, an ordinary hand saw file will suffice. Break off the front end of the file and grind to a blunt pyramid point. Whenever convenient to do so, the glass should be lain flat for drilling in order that the turpentine may not flow off from the point of the drill.

The use of a liquid under the boring tool is important and essential, and one of the best, being very effective, is made up of chemically pure ether $\frac{3}{4}$ ounce, camphor gum 1 ounce, turpentine $\frac{1}{2}$ ounce. A few drops of this liquid placed on the glass will enable the tool to bore into the glass readily. Emery powder, moistened with water, is useful also.

Glass may be perforated in the following manner: Have a ball of putty or wax, stick this on the spot where the hole is desired, then make a hole through the wax or putty the size you desire the hole in the glass, and pour acid in this hole. This will make the glass so soft at this spot as to allow the hole to be made very easily. Be very careful not to get acid on the hands or clothing.

To bore holes in a glass plate sign, use a rotary brass tube, filled with emery powder, kept damp with water. This is especially good for boring heavy plate glass. Keep the grinding end of the brass tube perfectly flat, its tendency being to wear round, whereby it would not hold the emery well.

Use a steel drill moistened with turpentine. (The drill must have a long point and plenty of clearance.) To file glass use a 12-inch mill file, simple cut and moistened with oil of turpentine. Large holes can be cut more rapidly with a tubular steel tool, made like a file at the end or with teeth. It is well to back

the glass with a sheet of lead, to prevent breakage by uneven pressure.

Secure an old three-cornered file the size of the hole desired in the plate and grind two sides of it to a point. This file can be put in, held and turned the same as a bit in an ordinary carpenter's brace. Lay the glass on a smooth surface with a small piece of cloth under the place where the hole is to be drilled. Take some soft putty and make a small ring around on the glass and fill the cuplike place with turpentine. Take the brace with the drill and begin boring the same as if boring in wood. Use a slight pressure on the brace, and in a short time you will have a clean-cut hole. A hole can be drilled in this way through the heaviest plate glass made.—*E. L. Kayser in Popular Mechanics.*

Another way: Heat drill to white heat and dip it into quicksilver to harden. Sharpen on whetstone, moisten with solution of camphor and oil of turpentine, keeping the bare hole moist, and glass may be drilled like wood.

CUTTING A ROUND HOLE IN A WINDOW LIGHT.—Mr. Charles E. Copp, a master car painter of New England, and well known writer, tells of a job of glass cutting that he was called to do, and how he did it. I will give his own interesting account of the process: "The cashier of the freight house wished to have a hole about three inches in diameter cut through his window to converse with customers through, instead of having to raise the sash and let in the cold. As I said, this appears simple enough, and a greenhorn would suppose that all you need to do is to run your diamond around the pattern the size you wish, when the circular piece would drop out or be easily knocked out; but here is the rub—to get that piece out without injury to the remainder of

the pane. And the only successful method that I know of—and this is practiced in the glass stores and shops in Boston—is to cut with your diamond a circle the size you wish with the aid of a thin wooden pattern (if you do not have a trammel with a diamond in it for cutting circles of all sizes) and then cut up this circular piece of glass into five checks by laying it all off into parallel lines one way less than one-fourth of an inch apart, being careful not to run your diamond over the circle nor quite to the edge; and then, at right angles with these lines, proceed in like manner to cut other parallel lines crosswise of these, thus laying it off into checks. I will not add any diagram, as I think you will get my meaning without it. Now lay your glass face down on your level glass-cutting board, if it is not set in a sash (if it is and in a window you can do it without), and by gentle taps with the handle of your diamond, or what is better, with the top end of a flat file, proceed to break the circle that you have cut clear through the glass all around. When this is done, hold the face of a hammer against the center of the circle on the opposite side of the cut, and with a file, the end of which has been broken off, proceed by gentle taps, on the other side, against the face of the hammer, to pulverize the glass sufficiently to put a hole through it, and then, by working very carefully from this hole in the same manner, continue to make the hole larger and larger toward the rim of the circle until you reach it and get a piece or two out, when all will readily fall out, leaving a clean-cut hole, free from cracks around it, which needs only to be smoothed with a whetstone and water, or, what is better, with a little grindstone and water, with the grindstone on an arbor running by power. If through plate glass the edges of the hole can be beveled and a nice effect produced. You

will find that this circle so binds in its place to the very last, though cut clear through the glass, that it will not let go until a segment of the rim is carefully worked out, and you will need to be very careful that a crack does not jump across the circle into the pane of glass and spoil it. Of course in this, as in most other things, 'practice makes perfect.' If any reader of this knows of a better way to do this, let him not hold his peace. I have heard of several recipes for doing it, such as heating an iron ring hot and putting it upon the glass; but like most book recipes they are not practical. Who would want to make an iron ring for every size of circle he wished to make? The real trouble is in getting the piece out after you have cut it, and that can only be done by pulverizing and pinching it out."

The master painter of a railway company gives the following account of a "simple arrangement for drilling holes in glass." He says: "It frequently becomes necessary to drill holes in glass signs, for the purpose of hanging them up, etc., and for this purpose the device here described and illustrated is intended. Get the wood turner to turn you out a main shaft of any suitable wood, and into it fit a balance arm loaded at the extreme end with lead, to make it heavy. At the upper end of main shaft have a revolving knob or handle, such as are used on a carpenter's brace and bit. Then at the lower end of shaft bore a tapering hole to hold the steel drill, which any good tool dressing blacksmith can make. The drill should be made about $2\frac{1}{2}$ or 3 inches long for an $\frac{1}{8}$ -inch drill, and proportionately longer for any of the larger sizes, and should be three-cornered at the end, and of good tempered steel. When boring the hole the glass must be kept wet with spirits turpentine. Give the drill a rotary swing to start it, and the balance arm with the loaded end

will easily keep the drill in motion, with a small exertion on the part of the operator. Place a small piece of sole leather or leather belting under the glass where you want the hole, as a safeguard against breakage. You will be surprised how easily and quickly you can drill a hole through the glass, and a little practice on the part of the operator will soon make him proficient in the operation. If it becomes necessary to have the hole any larger than the size of the drill, a small tapering 'rat-tail' file, saturated with spirits turpentine, will soon make it as large as desired. It is important that the drill or file shall be kept well wet with turpentine."

CHAPTER XLVII.

Gold Leaf Manufacture.



So far as the beating out of gold into thin leaves is concerned the art has made very little progress in the past three thousand years, for practically the same method was pursued by goldbeaters when Solomon was building his famous temple, when Tyre and Sidon ruled the seas, when Carthage disputed with Rome the supremacy of the world, as at present. Gold leaf as thin as any we make, has been found in the coffins of Egyptian mummies. While we admire the delicate skill of the modern gold beater, one must be still more astonished at the skill of the ancients, who lived in an age not marked by high civilization.

It is amazing to what extent this precious and ductile metal may be expanded by hammering. Take a cube of the metal five-eighths of an inch square, and the beater will hammer at it until it will cover the floor of a room 12x12 feet. He will take a bit of gold no larger than a pin head, and flatten it out until it will cover 25 square inches. Gold may be beaten until an ounce will cover 146 square feet of surface, and require 32,000 sheets to equal an inch in thickness. But this is not the limit. By the weight and measure of the best wrought gold leaf, it is found that one grain is made to cover $56\frac{3}{4}$ square inches; and from the specific gravity of the metal together with this admeasurement, it follows that the leaf itself is 1-280,000th of an inch thick. This, however, is not the limit of the malleability of gold, for the gold beaters find it neces-

sary to add three grains of copper in the ounce to harden the gold, which otherwise would pass round the irregularities of the newest skins, and not over them; and in using the old skins, which are not so perfect and smooth, they proceed so far as to add twelve grains.

Marvelous thinness, but a child can take a few drops of water, and adding a little soap to it, blow it out until it will take about fifty millions of the films to equal an inch.

HOW THE LEAF IS MADE.—Leaf is beaten out with hammers of various weights, the heaviest weighing 18 pounds, and the lightest 7 pounds. But to begin at the beginning, first an alloy of the desired color is made, then the metal is placed in a crucible and melted; after which it is made into ingots and flattened out by rolling between a pair of powerful steel rolls, which produces a ribbon an inch and one-half wide, and ten feet in length to the ounce. After being flattened it is annealed and cut into pieces of about six and a-half grains each, and placed between the leaves of a "cutch," which is about half an inch thick and three and a-half inches square, containing about 180 leaves of tough paper, manufactured for the purpose. This is beaten on for about twenty minutes with an 18-pound hammer, by which the gold is spread to the size of the cutch. Each leaf is then taken out and cut in four pieces. These are put between the leaves of a "shoder," four and a-half inches square and three-quarters of an inch thick, containing about 720 skins, which have been worn out in the "mould" or finishing process, described later. The shoder requires about two hours beating with a 7-pound hammer. Each leaf is again cut in four pieces and placed between the leaves of a "mould," composed of about 950 of the finest gold beaters' skins, five inches square and three-

quarters of an inch thick, the contents of one shoder filling three moulds. The material has now reached the last and most difficult stage of the process. During the first hour the hammer is allowed to fall principally on the center of the mould. This causes gaping cracks upon the edges of the leaves, the sides of which readily coalesce without leaving any trace of the union after being beaten upon. At the second hour, when the gold is about the 150,000 part of an inch in thickness, it for the first time permits the transmission of light. If the gold is pure, or but slightly alloyed, green rays pass through; when highly alloyed with silver, violet rays appear. As a rule about four hours' beating with a 7-pound hammer is required. A single ounce of gold will at this stage trim to about 1,200 leaves three and a-quarter inches square. The finished leaves are taken out of the mould, and the rough edges trimmed off by slips of the ratan fixed in parallel grooves of an instrument called a wagon, the leaf being laid upon a leather cushion for that purpose. The leaves are placed in "books," capable of holding twenty-five leaves each, which have been rubbed over with red ochre to prevent the gold from clinging to the paper.

The gold beater works like a machine, shifting the hammer from one hand to the other without once missing a blow. Each blow must be carefully directed uniformly and evenly throughout. The book called the shoder reduces the gold leaf sixteen times thinner than the original ribbon. The original 180 leaves are now cut into 2,880. In the final beating extra care must be exercised, as a false blow might tear the leaves. Neither paper nor vellum can be used to separate the leaves in the last hammering, the only satisfactory substance ever found being the outer coat of the *cæcum* or blind gut of the ox, which is specially prepared.

The preparation of this gut is interesting. When stripped off in lengths of two or three feet they are treated with an alkali solution, to free them of grease. Next they are made perfectly clean, and doubled over so that they stick and unite together. Various chemicals are then applied to increase the toughness of the material, after which they are ready for the gold beater. Although very tough and durable, the skins can be used for only about 200 beatings, and then new ones must be used. The cost of the skins can readily be computed when it is stated that for one mould from 150 to 500 oxen must be killed. The skins are in fact costlier than the gold placed in them. Often \$45 to \$50 are paid for the skins of a single mould.

Four hours of hammering with a 7-pound hammer is necessary to produce leaf suitable for a sign.

Easy as this work of beating out the gold may seem, it is, in reality, an art of a very delicate description. The workman must know to a nicety how hard or gentle the blows of his hammer must be, and also the exact spot on which they should fall. Accordingly, a very superior class of men are employed in the business.

RECOVERY OF THE WASTE LEAF.—An important consideration in gold beating is the recovery of the waste. There is a specific amount which must be recovered by each workman from the trimmings and scraps, and for all that each one returns above this he gets one dollar a pennyweight.

Gold beaters generally work with bare arms, and after their day's work wash hands and arms to recover the gold. Hair and clothes are shaken thoroughly for the same purpose. The fine particles of gold lodge everywhere, and occasionally a complete cleaning of the shop is made to secure these particles. In a shop which was recently torn down to make

room for a larger building, nearly five hundred dollars' worth of gold was recovered from the woodwork, floors and ceilings.

NUMBER OF GOLD BEATERS.—There are twenty to twenty-five gold beating establishments in this country, most of which are located in New York and Philadelphia, and upwards of 500 workmen are employed in them all. There are about forty gold beaters in Chicago.

Although the number of men who manufacture gold leaf is comparatively inconsiderable, their product is very valuable, "a little gold leaf going a very long way," as one maker put it.

HOW THEY WORK.—The long, low building in which the work is carried on is filled throughout the day with the sound of hammers. On every side little boxes containing tiny rolls of gold are to be seen, which, although only measuring an inch and a-half in length, are each worth about \$50. The gold is received in bars one-eighth of an inch in thickness, an inch in width, and weighing 240 pennyweights. This is rolled out into a ribbon thirty yards in length.

It is then given to the workmen in strips measuring seven yards, each of which is cut up into 180 pieces. These are now ready to be beaten out by hand. They are placed (protected by fine skins) in a tool known as the "cutch," and are thoroughly pounded out on a great granite block, set in the ground in such a way that there is absolutely no vibratory movement.

AMOUNT OF ALLOY.—A certain amount of alloy must of necessity go into the metal before it can be beaten into thin leaves, leaves so thin that it is said that the ordinary kind measure 282,000th of an inch, while that made by the French is said to be as thin again as this, or very nearly so. An ounce of gold

may be beaten into 1,600 leaves of three inches square each. Ordinarily about one-eightieth part of the leaf is alloy. This alloy is silver or copper, or in some cases both are used together. The silver, of course, lightens the color, and the copper deepens the color. But the beater cannot add too much alloy, for then he could not beat out his leaf as thinly as where less alloy is used, and hence he would get more gold into his leaf because of the increased thickness of it.

There are several shades of gold leaf. The medium is perhaps the most generally useful to the sign painter. Upon exposure outdoors the leaf will of course tarnish some, and to overcome this it is sometimes recommended that the leafed letters be coated with a coat of clear exterior varnish. But the medium leaf gives good service outdoors without any protective coating.

The best gold leaf for gilding on wood is the XXX brand, and the American leaf leads the world.

In buying gold leaf be careful to get it from a manufacturer of known reputation for good leaf. Of course he makes poor leaf, too, for special purposes, but sells it for what it is.

TESTING GOLD LEAF.—Test gold leaf by touching it with a nitrate of silver solution; if alloyed this will show a gray effect.

Pour a few drops of aqua fortis on a clean piece of glass and lay a piece of gold leaf so that one part of it rests on the aqua fortis and part on the dry glass, and by holding the glass against the light it can be seen whether the gold has been attacked or partly decomposed by the aqua fortis. Pure gold will resist the acid, while all alloys will resolve.

PATENT LEAF.—What is known as patent gold leaf is simply ordinary gold leaf that has been so fixed to the book in which it is placed that it adheres to the

paper so that it will not readily blow away, but will remain smoothly attached and allow of cutting or handling until it touches the size to which it is to adhere permanently. It is well adapted in this form for outdoors use, or for indoors use as well, on anything but glass. There is less waste than with the loose leaf, and it is easily handled, especially by the amateur. The idea of fastening the gold leaf to the paper of the book has long been known to sign painters, and just why the process is now called "patent" we are unable to explain.

WEIGHING GOLD LEAF.—The best way to ascertain the thickness of the gold leaf is to weigh a piece of known area. Thus, a square meter will weigh from 2.14 to 2.76 grams, and as the specific gravity of the gold is about 19.3, the thickness of the leaf must be .00011-.00014 millimeter (say about one two hundred thousandth part of an inch). For the sake of comparison it may be mentioned that a square meter of thin cigarette paper weighs from 7 to 8 grms., although its substance has a specific gravity so much less than that of gold. The gold leaf is green by transmitted light.

GOLD LEAF IN GERMANY.—Vice-Consul Oscar Bock, of Nuremberg, submits the following report on the industry of making gold leaf in Germany: This industry is carried on principally at Nuremberg, Furth and Schwabach by several large concerns and many small ones. The total output is estimated by one of the leading concerns at 6,000 packets of 500 leaves each per week, the value of the annual product being probably about \$1,500,000. The cost of production per packet of 500 leaves, $3\frac{3}{4}$ inches square, is said to be approximately 4.5 marks (\$1.07). The wholesale price per packet of size stated was, in 1908, \$4.35 to

\$4.40 f.o.b. New York, exclusive of duty. The retail price in small quantities is said to be 15 or 20 per cent. more than the wholesale price. One of the leading concerns in this trade furnishes the following wages per week as the usual rates in this industry under normal conditions: Experienced men, 35 to 50 marks (\$8.33 to \$11.90); helpers, 20 to 30 marks (\$4.75 to \$7.14); gold cutters (female), 10 to 16 marks (\$2.38 to \$3.81). Much of the labor is done by piece work, for which a scale of prices is agreed upon by employers and the gold beaters' union. Under the present scale the wages are approximately as stated. About two-thirds of the output of gold leaf from this locality is said to go to England, the remaining one-third being consumed in Germany, United States, Canada, India, and other countries. The value of the declared export of this product from this district to the United States in 1908 was \$39,648. The total importations of gold leaf into the United States in the fiscal year 1908 amounted to 14,796 packs of the 500 leaves, the value being \$68,417. The importations the previous year were 35,849 packs, worth \$167,263. The rate of duty is \$1.75 per pack.

CHAPTER XLVIII.

How Bronze Powder in Colors and Tin Foil Are Made.



ERR NEIDHART gives this interesting description of the manufacture of colored bronze powders: The production of imitation leaf gold is done by power, and the bronze colors are simply sheets of the metal pulverized. There are four kinds, and they are alloys of copper or tin with zinc. It is important that the copper should be pure. The alloys are cast into semi-cylindrical sticks, which are first hammered and then rolled into ribbons. These are twisted together like telegraph cables and packed into a cast-iron box with all the rest of the space filled with coal dust to prevent oxidation of the metal, and then heated red-hot. They are then hammered out into bands from two to four inches wide and treated with tartaric acid. A pile is then made of fifty or sixty sheets, which is subjected to from 320 to 340 blows a minute from a hammer weighing from 30 to 35 kg. Great care has to be taken to move the metal about under the hammer. Two consecutive blows on the same spot will dent or crack the metal. The pulverization is effected by stamps. These weigh about 55 kg. each and fall fifty times a minute from a height of six or seven inches. The fine powder thus obtained is not bright enough, and has to be ground in a mill. To prevent loss it is first made into a stiff paste with gum arabic and water. About 25 kg. of this paste are put in a mill with conical rollers for five or six hours. The gum is then removed by water, and the powder is slowly

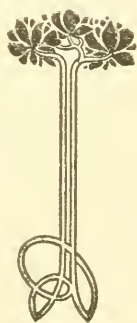
dried and oiled slightly. It is then dried in a copper kettle, an operation which requires much skill and experience. Coal tar colors are the ones chiefly used.

Bronze colors are turned green by damp, and black by sulphuretted hydrogen. Of late precipitated metallic oxides have been put on the market as substitutes for the metallic powders, but they are inferior to them both in lustre and in covering power.

Attempts have been made to produce these metallic powders by filing and by separating a stream of molten metal, but so far without success.

HOW IS TIN FOIL MADE?—Tin foil is not made of lead, as some think, but of tin, in the following manner: A pipe is made of pure tin, and this is filled with lead; the whole is then beaten, the same as gold leaf is beaten out, the tin coating spreading with the lead core. The three sheets which follow are sometimes reduced to a thickness of .0001 of an inch.

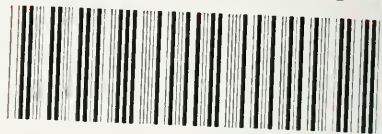
THE END.



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